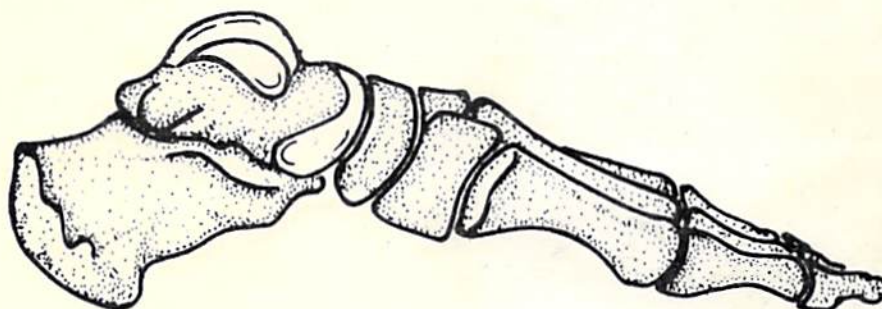


ATLAS OF ANATOMY

LOWER LIMB



by
FAWZI GABALLAH
ZAIZAFON BADAWY

17

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P R E F A C E

This " ATLAS OF ANATOMY " contains 361 figures on the Anatomy of Lower Limb. It is based on regional approach with a chapter on the bones and another chapter on the joints. Almost all the anatomical facts are illustrated in a clear and artistic way. All the diagrams are line drawings which are provided with concise explanatory notes.

The authors hope that this diagrammatic atlas will be of value to the medical student who will find the book an effective teaching means which makes much of the Anatomy easy to understand and easy to remember.

Cairo, 1987

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PREFACE

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OTHER BOOKS BY PROF. FAWZI GABALLAH

1. Atlas of Embryology.
2. Basic Embryology
3. A Summary of Anatomy (all parts).
4. Basic Neuroanatomy.
5. Oral Questions in Anatomy.
6. Spotting (a guide to practical anatomy).

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BONES

HIP BONE

1

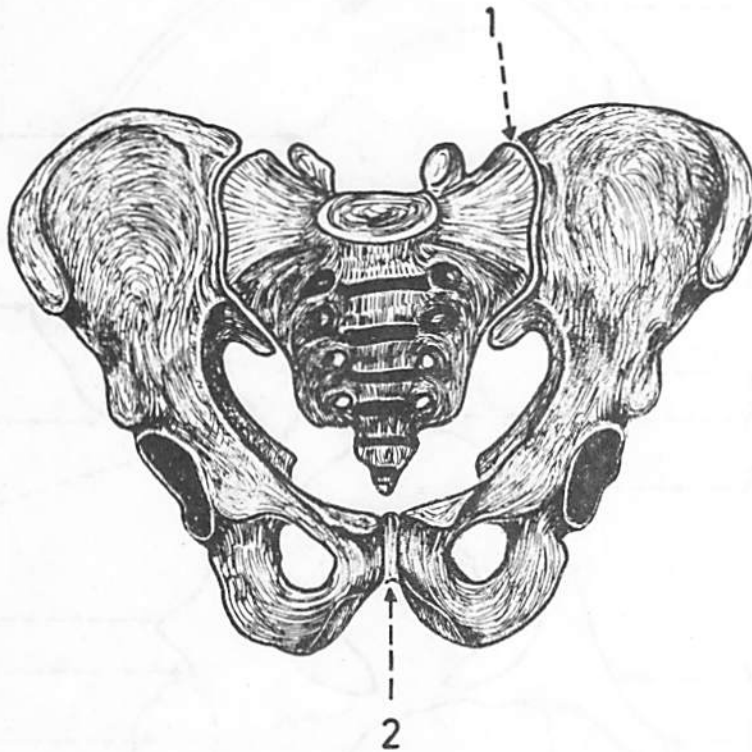


Fig.(1): ARTICULATIONS OF HIP BONE

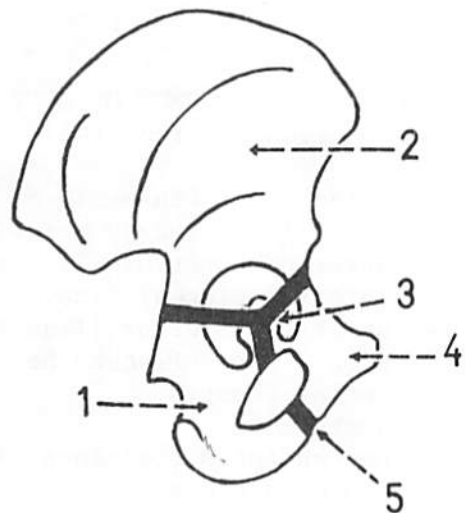
The hip bone forms the anterior and lateral walls of the bony pelvis. It has 2 articulations: sacro-iliac joint and symphysis pubis.

1. sacro-iliac joint (synovial).
2. symphysis pubis (cartilagenous).

Fig.(2): PARTS OF HIP BONE

The hip bone is formed of 3 parts called ilium, pubis and ischium.

1. ischium.
2. ilium (the largest).
3. triradiate cartilage (ossifies at 15 years).
4. pubis.
5. cartilage between the ischial and pubic rami (ossifies at 8 years).



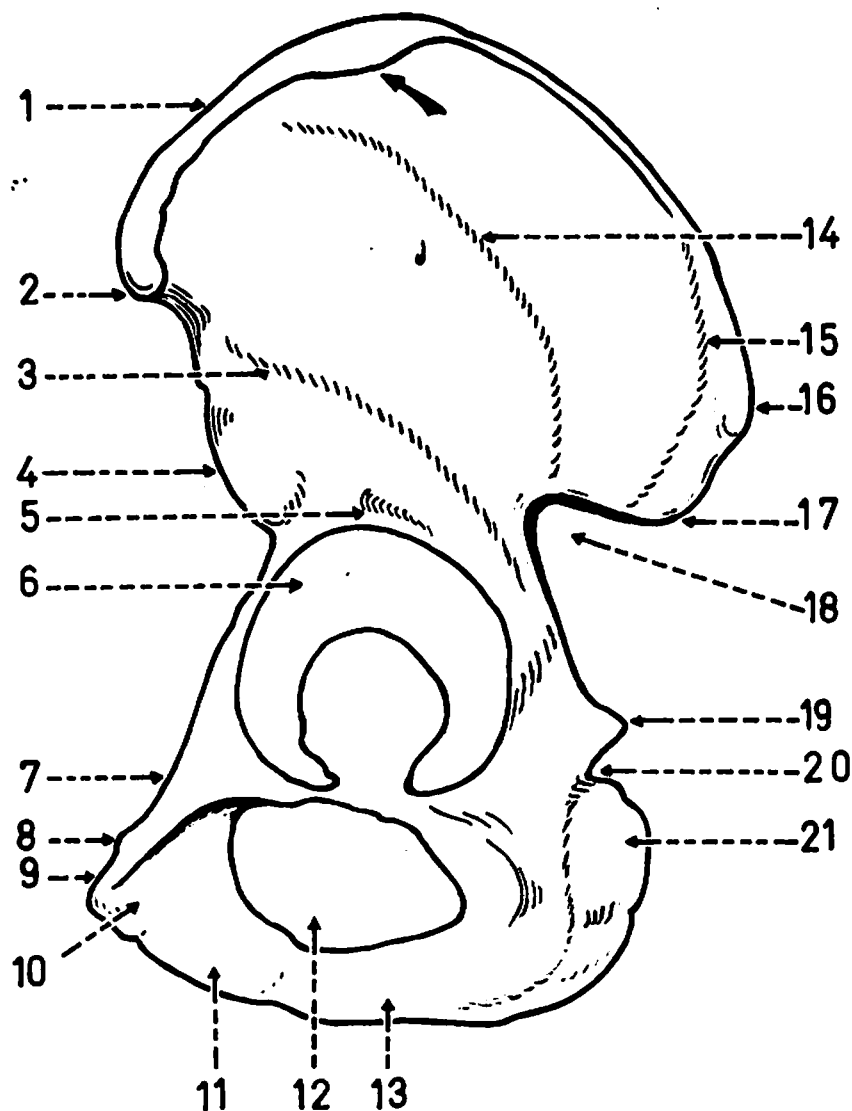


Fig. (3): OUTER ASPECT OF LEFT HIP BONE
(general features)

- | | |
|--|--|
| 1. iliac crest (tubercle of iliac crest is marked by arrow). | 11. inferior pubic ramus. |
| 2. anterior superior iliac spine. | 12. obturator foramen. |
| 3. inferior gluteal line. | 13. ischial ramus. |
| 4. anterior inferior iliac spine. | 14. anterior gluteal line. |
| 5. groove for reflected head of rectus femoris. | 15. posterior gluteal line. |
| 6. acetabulum. | 16. posterior superior iliac spine. |
| 7. pecten pubis (pectineal line). | 17. posterior inferior iliac spine. |
| 8. pubic tubercle. | 18. greater sciatic notch. |
| 9. pubic crest. | 19. ischial spine. |
| 10. body of pubis. | 20. lesser sciatic notch. |
| | 21. ischial tuberosity (on the body of ischium). |

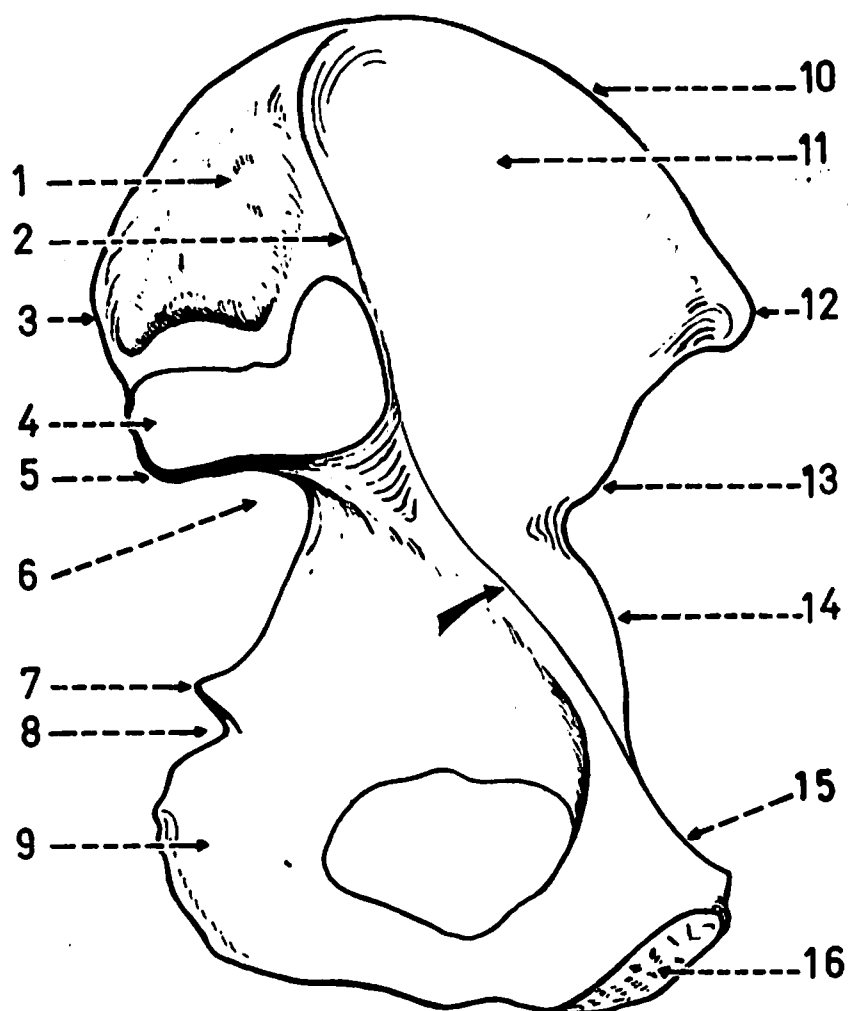


Fig.(4): INNER ASPECT OF LEFT HIP BONE
(general features)

1. iliac tuberosity (elevated rough area).
2. medial border of ilium (its anterior extension is called arcuate line, marked by arrow).
3. posterior superior iliac spine.
4. auricular surface (like the auricle of the ear).
5. posterior inferior iliac spine.
6. greater sciatic notch.
7. ischial spine.
8. lesser sciatic notch.
9. body of ischium
10. iliac crest.
11. iliac fossa.
12. anterior superior iliac spine.
13. anterior inferior iliac spine.
14. iliopubic eminence (iliopectineal eminence).
15. pecten pubis (pectineal line).
16. medial or symphyseal surface of pubis.

Fig.(5): LEFT ILIAC CREST
(general features)

It is sinuously curved with its anterior 2/3 concave inwards and its posterior 1/3 concave outwards.

1. inner lip.
2. intermediate area.
3. anterior superior iliac spine.
4. posterior superior iliac spine.
5. tubercle of iliac crest.
6. outer lip.

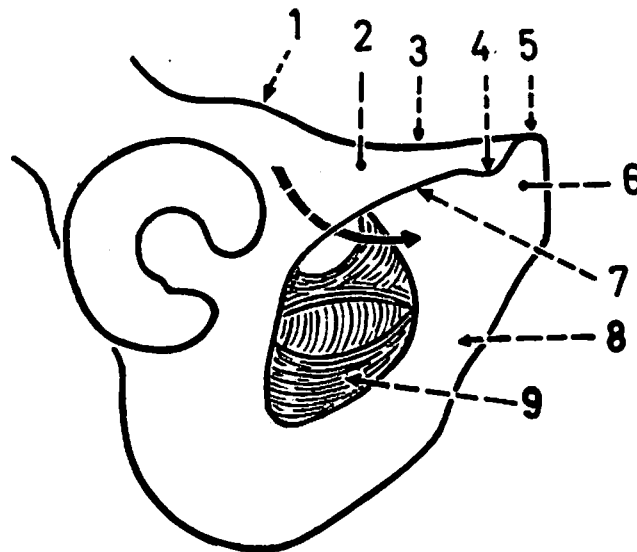
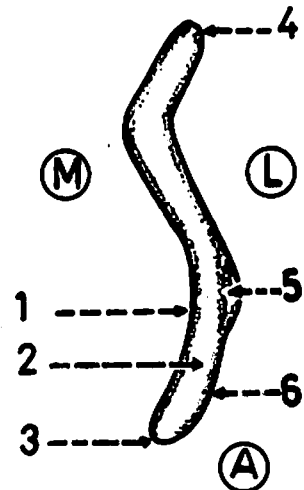


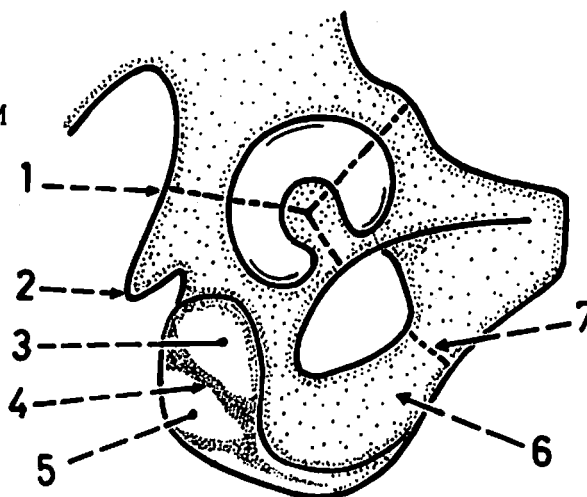
Fig.(6): OUTER ASPECT OF RIGHT PUBIS
(general features)

1. iliopubic eminence(junction between ilium and pubis).
2. pectineal surface of superior pubic ramus.
3. pecten pubis (pectineal line).
4. pubic tubercle (at lateral end of pubic crest).
5. pubic crest (upper border of body of pubis).
6. body of pubis.
7. obturator crest.
8. inferior pubic ramus.
9. obturator membrane filling the obturator foramen.

* The arrow indicates the obturator groove which lies on the inferior surface of the superior pubic ramus.

Fig.(7): OUTER ASPECT OF RIGHT ISCHIUM
(general features)

1. junction between ischium and ilium.
2. ischial spine.
3. upper lateral area of ischial tuberosity.
4. oblique ridge of ischial tuberosity.
5. lower medial area of ischial tuberosity.
6. ischial ramus.
7. junction between ischium and pubis.

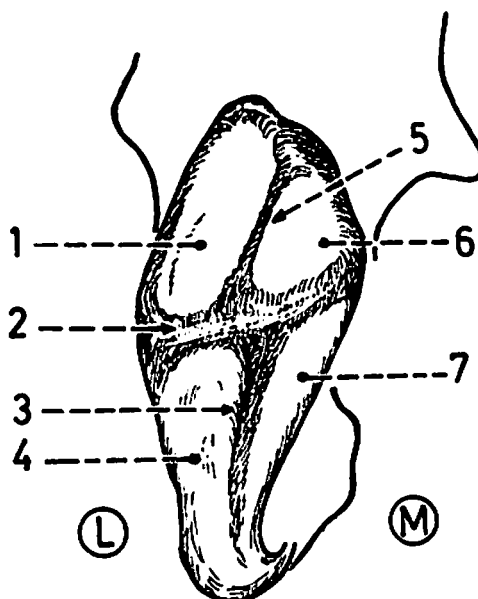


* The ischial spine intervenes between the greater and lesser sciatic notches.

Fig.(8): ISCHIAL TUBEROSITY
(general features)

It is divided by a transverse ridge into upper and lower parts. The upper part is divided by an oblique ridge into upper lateral and lower medial areas. The lower part is divided by a longitudinal ridge into lateral and medial areas.

1. upper lateral area of upper part.
2. transverse ridge.
3. longitudinal ridge.
4. lateral area of lower part.
5. oblique ridge.
6. lower medial area of upper part.
7. medial area of lower part.



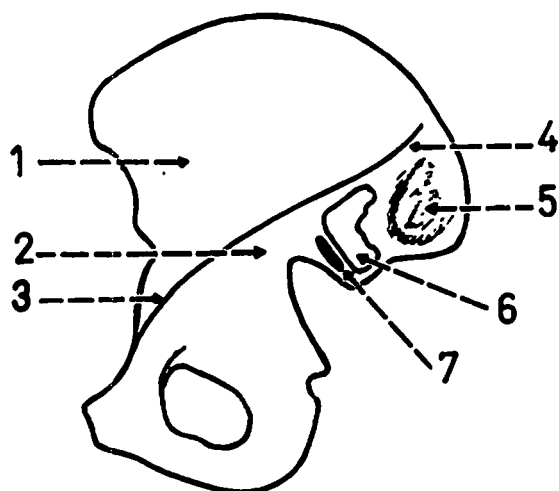


Fig.(9): INNER ASPECT OF ILIUM
(general features)

The medial border of ilium separates the iliac fossa (above) from the sacropelvic surface (below).

1. iliac fossa.
2. pelvic part of sacropelvic surface (forms part of pelvic cavity).
3. arcuate line (anterior extension of medial border).
4. medial border of ilium.
5. iliac tuberosity.
6. auricular surface.
7. pre-auricular sulcus (more marked in females).

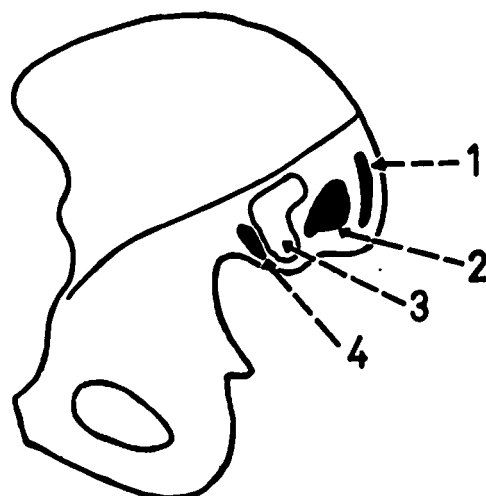


Fig.(10): STRUCTURES ATTACHED TO
SACROPELVIC SURFACE

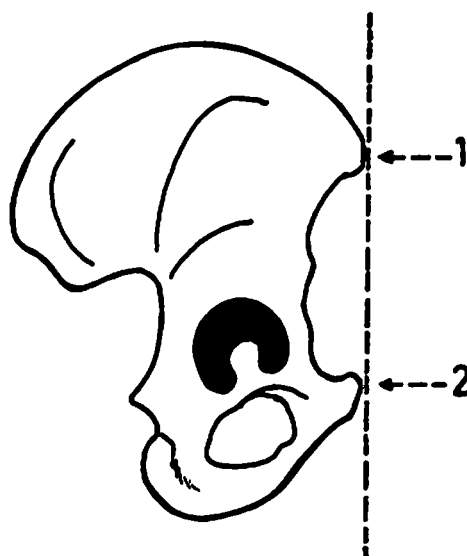
1. posterior sacro-iliac ligament (to posterior part of iliac tuberosity).
2. interosseous ligament (to the iliac tuberosity).
3. auricular surface (for the sacro-iliac joint).
4. anterior sacro-iliac ligament (to the pre-auricular sulcus).

* All the structures attached are ligaments to support the sacro-iliac joint.

Fig.(11): ORIENTATION OF HIP BONE

In the anatomical position, the anterior superior iliac spine and the pubic tubercle should lie on the same vertical plane.

1. anterior superior iliac spine.
2. pubic tubercle.



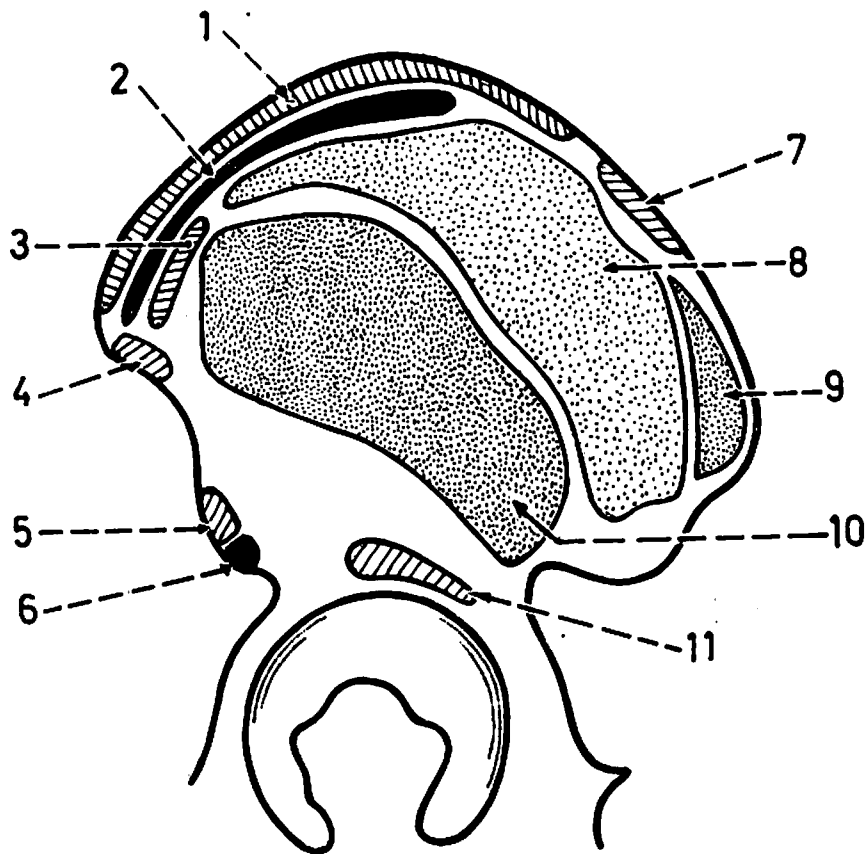


Fig.(12): OUTER ASPECT OF ILIUM
(particular features)

1. internal oblique muscle of abdomen (origin).
2. external oblique muscle of abdomen (insertion).
3. tensor fasciae latae (origin).
4. sartorius (origin).
5. straight head of rectus femoris (origin).
6. iliofemoral ligament.
7. latissimus dorsi (origin).
8. gluteus medius (origin).
9. gluteus maximus (origin).
10. gluteus minimus (origin).
11. reflected head of rectus femoris (origin).

* The outer surface of the ilium is called gluteal surface because it gives origin to the 3 gluteal muscles (maximus, medius and minimus).

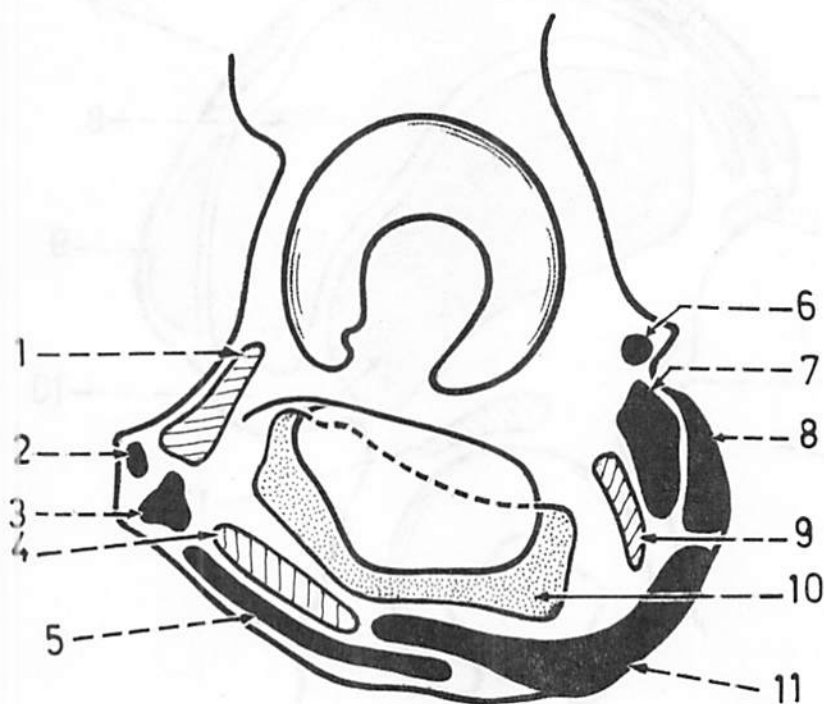


Fig.(13): OUTER ASPECT OF PUBIS AND ISCHIUM
(particular features)

1. pectineus (origin).
2. rectus abdominis (origin).
3. adductor longus (origin, just below the pubic tubercle).
4. adductor brevis (origin).
5. gracilis (origin).
6. superior gemellus (origin).
7. semimembranosus (origin, from the upper lateral area of ischial tuberosity).
8. combined origin of semitendinosus and long head of biceps (from the lower medial area of the ischial tuberosity).
9. quadratus femoris (origin, from the lateral margin of ischial tuberosity).
10. obturator externus (origin).
11. adductor magnus (the ischial part arises from ischial tuberosity while the pubic part arises from the side of the pubic arch).

* The 3 adductor muscles are arranged one above the other.

* In the pubic arch the muscles are arranged as follows: gracilis (most medial), obturator externus (most lateral) while the adductors lie in between.

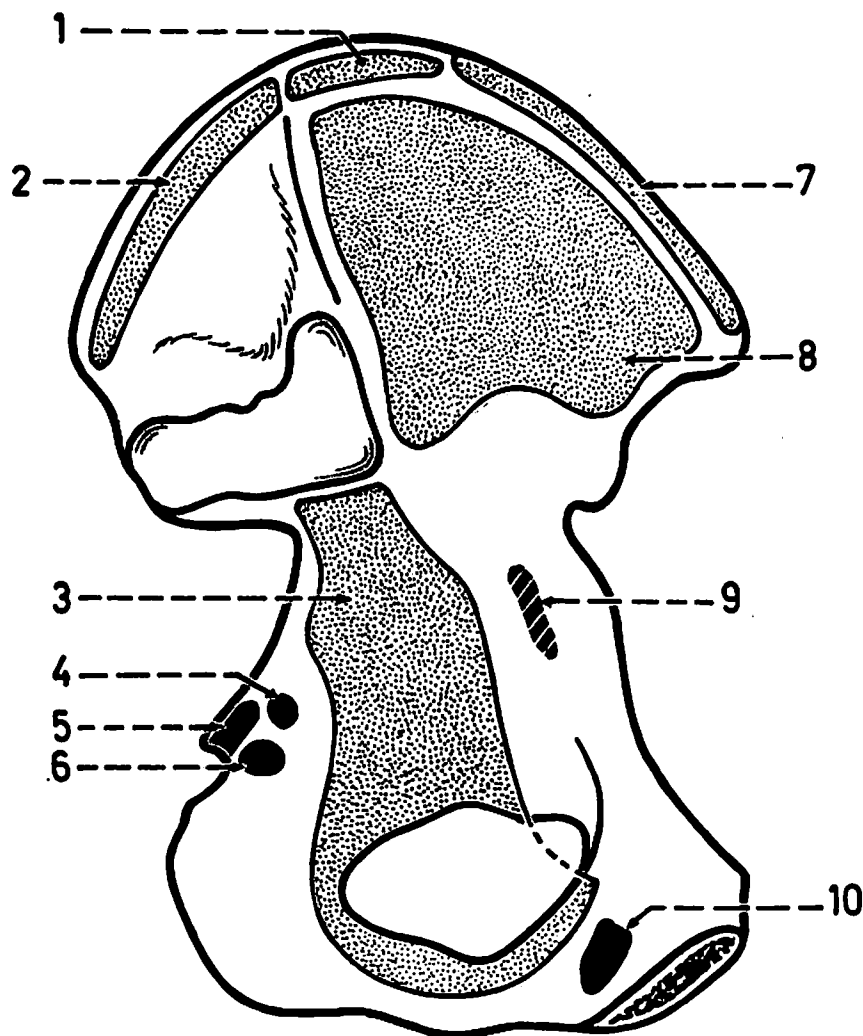


Fig.(14): INNER ASPECT OF HIP BONE
(particular features)

1. quadratus abdominis (origin).
2. sacrospinalis or erector spinae (origin).
3. obturator internus (origin).
4. coccygeus (origin).
5. sacrospinous ligament (to the ischial spine).
6. levator ani (origin of its most posterior part).
7. transversus abdominis (origin).
8. iliacus (origin from the whole iliac fossa).
9. psoas minor (insertion, into the iliopubic eminence).
10. levator ani (origin of its most anterior part).

* The iliacus and obturator internus have the most extensive bony origin from the inner aspect of the hip bone.

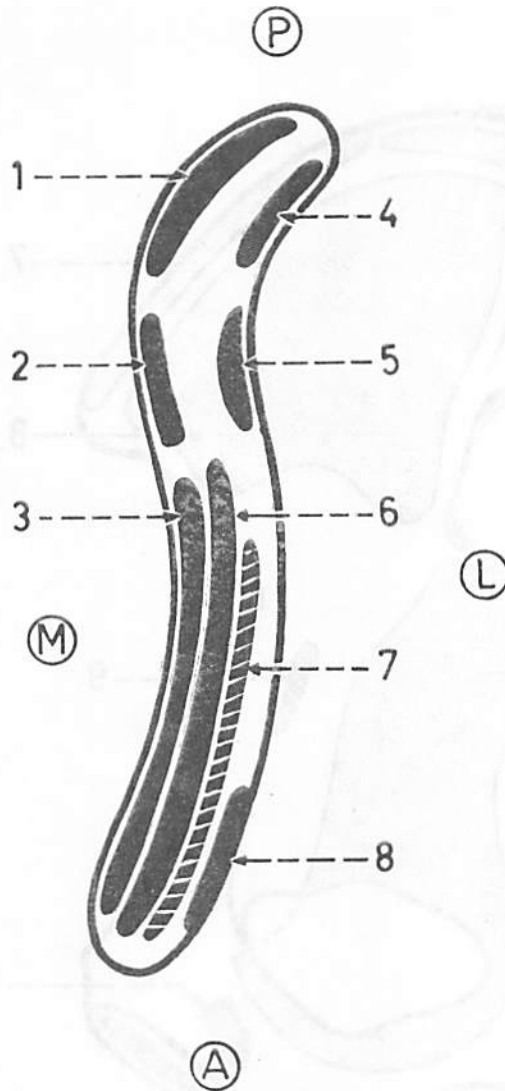


Fig.(15): LEFT ILIAC CREST
(particular features)

1. sacrospinalis or erector spinae (origin).
2. quadratus lumborum (origin).
3. transversus abdominis (origin, from the inner lip).
4. gluteus maximus (origin, from the most posterior part of the outer lip).
5. latissimus dorsi (origin)
6. internal oblique of abdomen (origin, from the intermediate area).
7. external oblique of abdomen (insertion, into the outer lip).
8. tensor fasciae latae (origin, from the anterior 5 cm of the outer lip).

Fig.(16): ACETABULUM
(general features)

It forms the socket of the hip joint and it has an articular part and a non-articular part.

1. lunate surface (horseshoe-shaped articular surface which encircles a rough non-articular area).
2. acetabular notch (a deficiency on the inferior margin of the acetabulum).

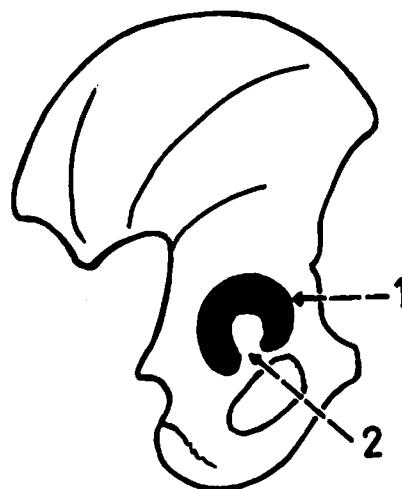


Fig.(17): ACETABULUM
(particular features)

1. capsule of hip joint (to the margin of the acetabulum just outside the labrum acetabulare).
2. ligament of the head of femur (from the fovea on the head of femur to the transverse ligament of acetabulum).
3. transverse ligament of acetabulum (bridging over the acetabular notch).

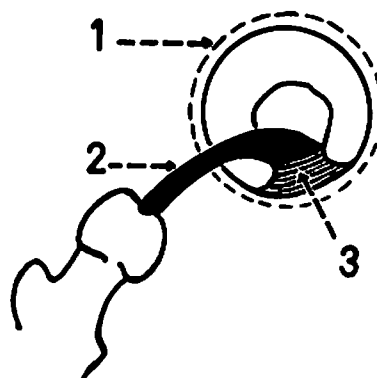


Fig.(18): STRUCTURES ATTACHED TO THE TWO ANTERIOR ILIAC SPINES

A ligament and a muscle are attached to each spine.

1. inguinal ligament (to upper part of anterior superior iliac spine).
2. sartorius (from the lower part of anterior superior iliac spine).
3. straight head of rectus femoris (from upper part of anterior inferior iliac spine).
4. iliofemoral ligament (to lower part of anterior inferior iliac spine).

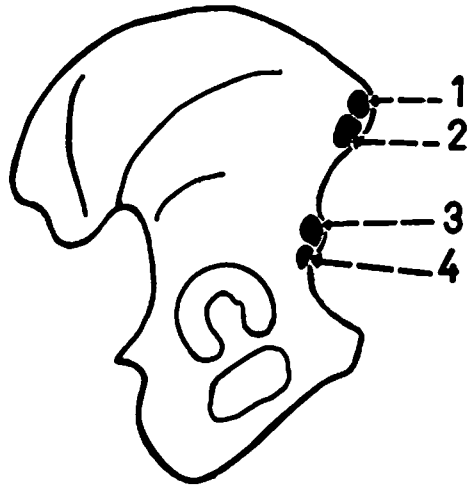
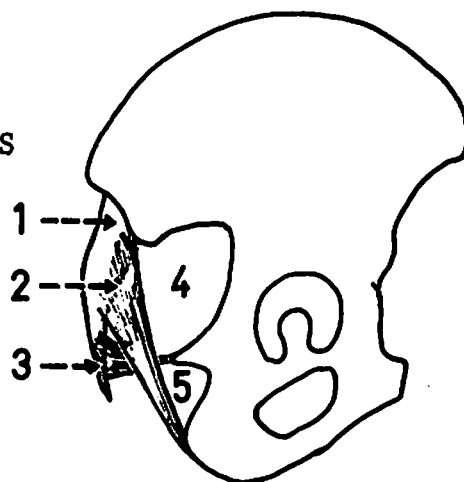


Fig.(19): SACROTUBEROUS AND SACROSPINOUS LIGAMENTS

1. margin of the sacrum.
2. sacrotuberous ligament.
3. sacrospinous ligament.
4. greater sciatic foramen.
5. lesser sciatic foramen.



* These 2 ligaments transform the greater and lesser sciatic notches into foramina.

Fig.(20): PUBIC ARCH

It is formed by the conjoined pubic and ischial rami of both sides. It forms a right angle in the female and an acute angle in the male.

1. symphysis pubis.
2. sides of the pubic arch.
3. edge of the pubic arch (related to the crus of penis or crus of clitoris, so it is more everted in the male).

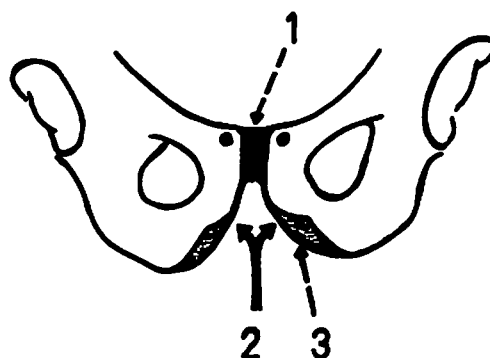
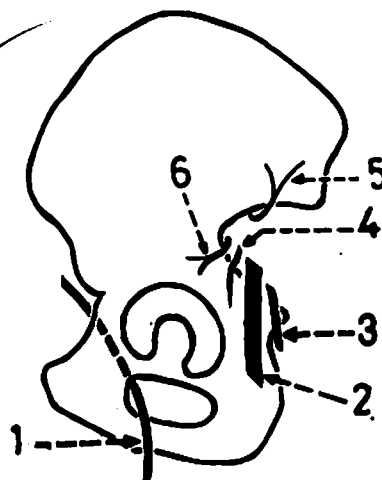


Fig.(21): NERVES IN CONTACT WITH THE HIP BONE

1. obturator nerve (in the obturator groove).
2. sciatic nerve (on the back of ischium).
3. pudendal nerve (on the back of ischial spine).
4. nerve to quadratus femoris (on the back of ischium).
5. superior gluteal nerve.
6. inferior gluteal nerve.



* These nerves (especially the sciatic and obturator) are liable to injury in fracture of the hip bone.

Fig.(22): SUBCUTANEOUS PARTS OF HIP BONE

These are surface bony landmarks which can easily be felt under the skin.

1. anterior superior iliac spine.
2. pubic tubercle.
3. tubercle of iliac crest.
4. iliac crest.
5. posterior superior iliac spine.
6. ischial tuberosity.

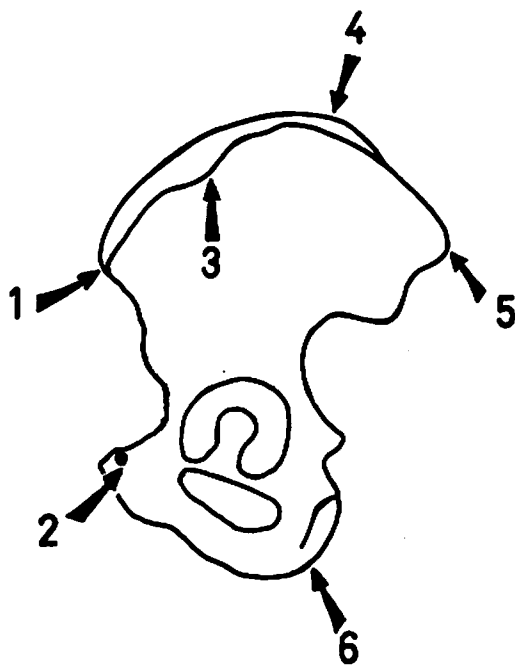


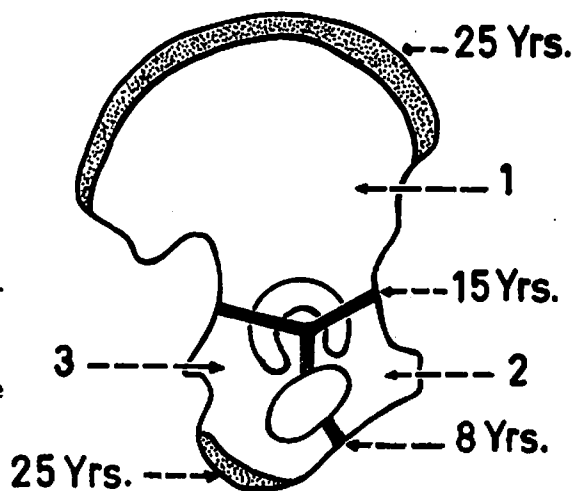
Fig.(23): OSSIFICATION OF THE HIP BONE

1. ilium.
2. pubis.
3. ischium.

* The conjoined pubic and ischial rami are the 1st to fuse together (8 years).

* The 3 parts of the hip bone unite in the acetabulum just after puberty (15 years).

* The ossific centres of iliac crest and ischial tuberosity are the last to unite (25 years).



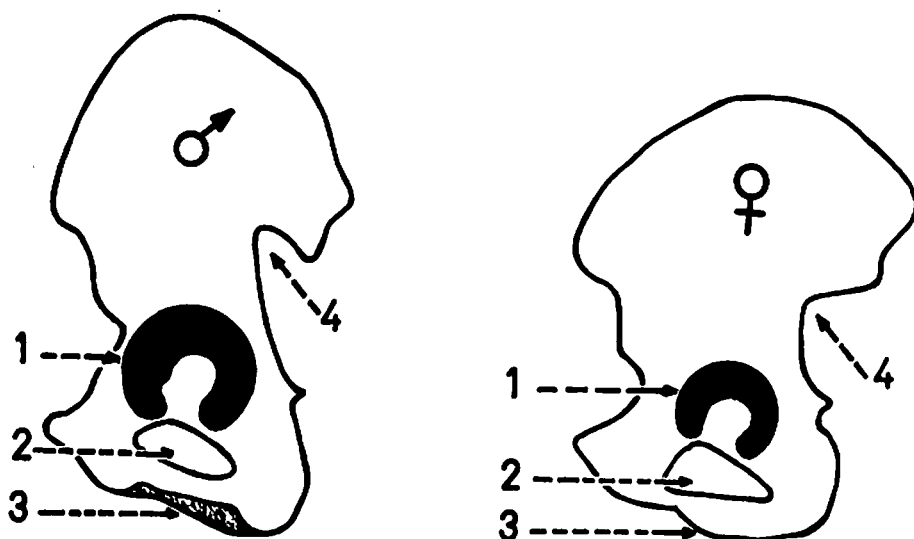


Fig.(24): SEX DIFFERENCES IN HIP BONE

1. acetabulum: in the female the transverse diameter of the acetabulum is smaller than the distance from the symphysis pubis to the anterior margin of the acetabulum. In the male the 2 measurements are nearly equal (see fig.25).
2. obturator foramen: is triangular in female but oval in male (not a sure sign).
3. edge of pubic arch: more everted in male than in female.
4. greater sciatic notch: deep and narrow in male but shallow and wide in female.

* The pre-auricular sulcus when present is a sign of a female hip bone, especially when it is deep.

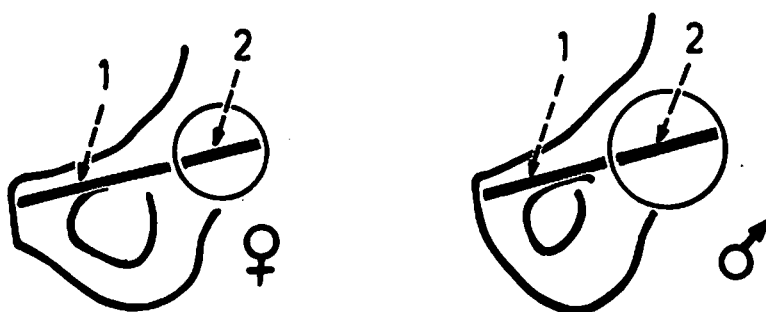


Fig.(25): DIAMETER OF THE ACETABULUM AS A SEX FEATURE

1. distance from symphysis pubis to anterior margin of acetabulum.
2. transverse diameter of acetabulum.

The distance from the symphysis pubis to anterior margin of acetabulum (1) is longer than the transverse diameter of acetabulum (2) in female but are nearly equal in male.

FEMUR

Fig.(26): ANTERIOR ASPECT OF LEFT FEMUR
(general features)

1. fovea or pit for the ligament of head of femur.
2. neck of femur (makes an angle of 125° with the shaft).
3. intertrochanteric line (between the 2 trochanters).
4. lesser trochanter.
5. shaft.
6. adductor tubercle (on the uppermost part of medial condyle).
7. medial epicondyle (the most prominent point on medial condyle).
8. head of femur (forms more than $1/2$ a sphere).
9. greater trochanter.
10. lateral epicondyle (the most prominent point on lateral epicondyle).
11. groove for popliteus (just below the lateral epicondyle).
12. patellar surface (articular surface for the patella).

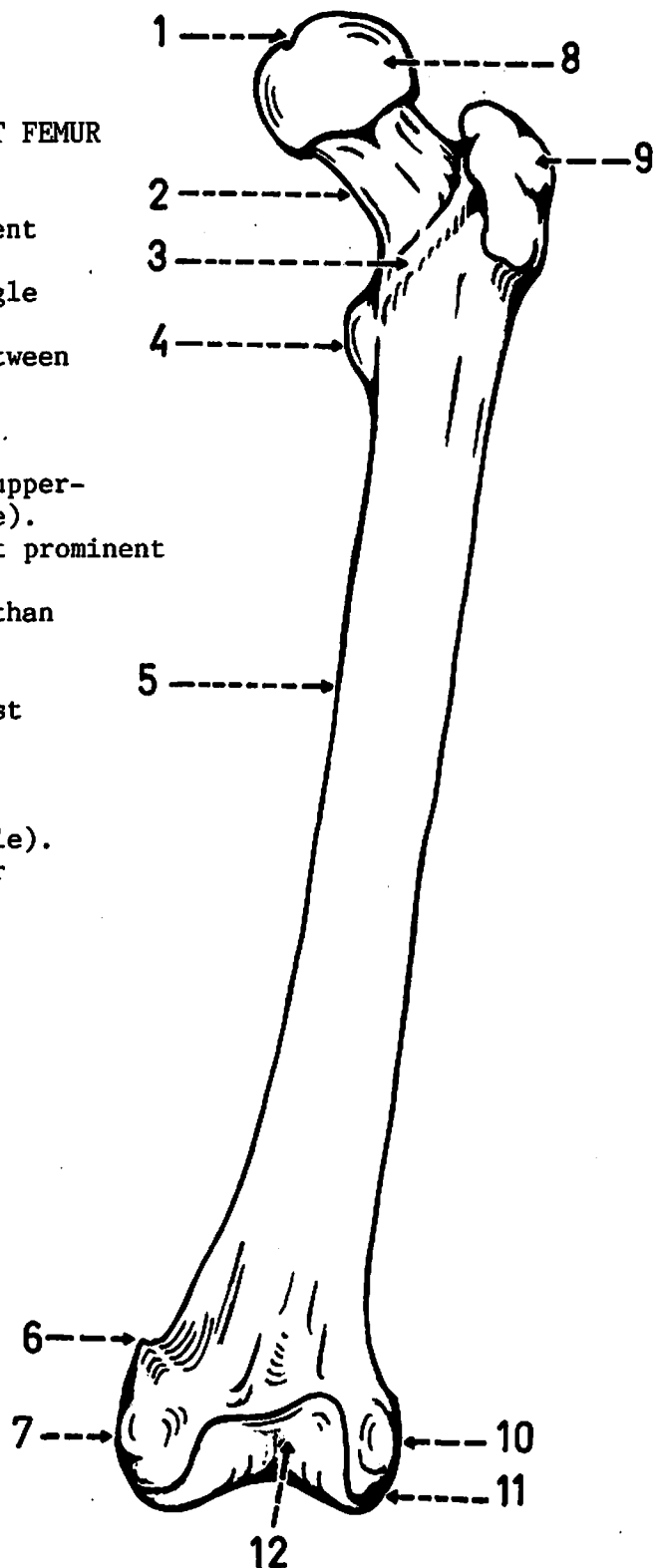


Fig.(27): POSTERIOR ASPECT OF LEFT FEMUR
(general features)

1. head of femur.
2. trochanteric fossa (a depression on the medial surface of greater trochanter).
3. greater trochanter.
4. quadrate tubercle (on the middle of the intertrochanteric crest).
5. gluteal tuberosity (extends between the greater trochanter and linea aspera).
6. linea aspera (forms the posterior border of femur and has 2 lips).
7. lateral supracondylar line.
8. popliteal surface (between the 2 supracondylar lines).
9. lateral epicondyle.
10. fovea on the head of femur.
11. neck of femur.
12. intertrochanteric crest (a ridge between the 2 trochanters).
13. lesser trochanter.
14. spiral line (extends spirally from the intertrochanteric line to linea aspera).
15. nutrient foramen (directed away from the knee).
16. medial supracondylar line.
17. adductor tubercle.
18. medial epicondyle.
19. intercondylar fossa (between the 2 condyles).

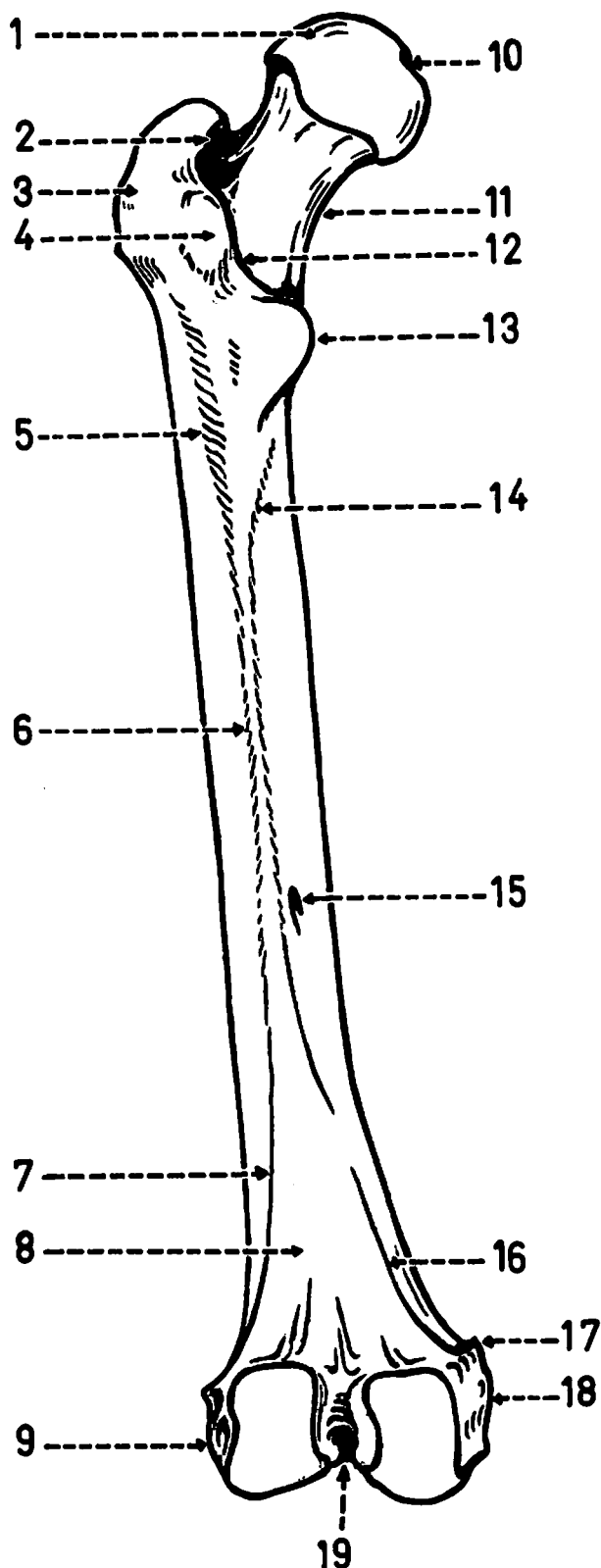


Fig.(28): ANTERIOR ASPECT OF LEFT FEMUR
(particular features)

1. vastus medialis (origin of its uppermost part).
2. articularis genu (origin).
3. piriformis (insertion into the tip of greater trochanter).
4. gluteus minimus (insertion into the anterior aspect of greater trochanter).
5. vastus lateralis (origin of its uppermost part).
6. vastus intermedius (origin from the anterior and lateral surfaces of the shaft).
7. popliteus (origin from the groove just below the lateral epicondyle).

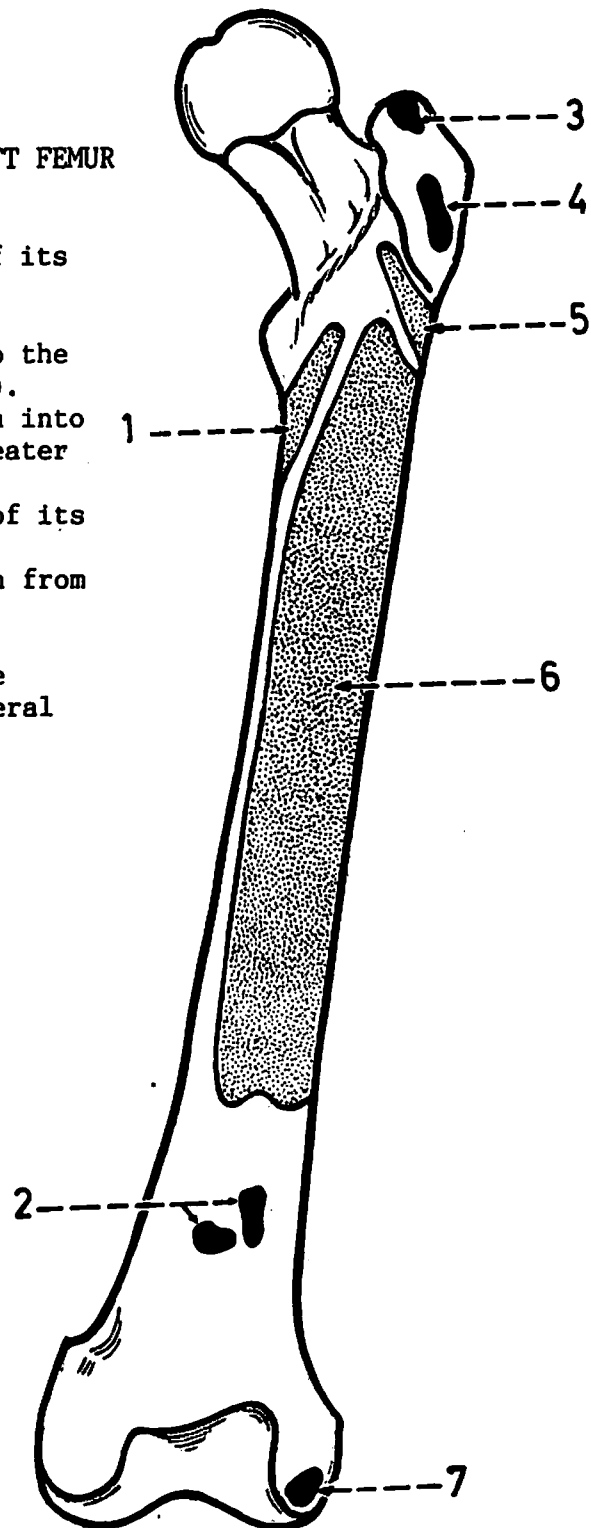
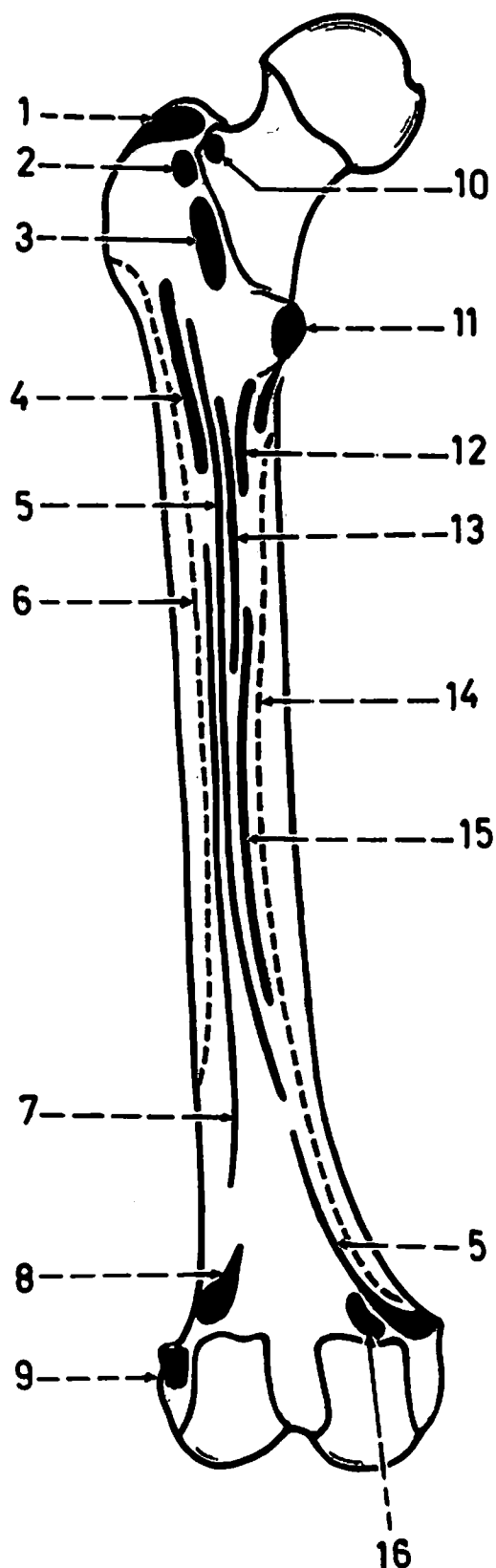


Fig.(29): POSTERIOR ASPECT OF LEFT FEMUR
(particular features)

1. gluteus medius (insertion).
2. obturator internus (insertion into the medial aspect of greater trochanter).
3. quadratus femoris (insertion into the quadrate tubercle).
4. gluteus maximus (insertion of its deep 1/4 into gluteal tuberosity).
5. adductor magnus (linear insertion into gluteal tuberosity, linea aspera, medial supracondylar line and adductor tubercle).
6. vastus lateralis (origin, the most lateral muscle).
7. short head of biceps femoris (origin from linea aspera and lateral supracondylar line).
8. plantaris (origin from lower part of lateral supracondylar line and popliteal surface).
9. lateral head of gastrocnemius (origin from lateral condyle above and behind the epicondyle).
10. obturator externus (insertion into trochanteric fossa).
11. iliopsoas (insertion into lesser trochanter).
12. pectineus (insertion).
13. adductor brevis (insertion into upper 1/3 of linea aspera).
14. vastus medialis (origin, the most medial muscle).
15. adductor longus (insertion into the middle 1/3 of linea aspera).
16. medial head of gastrocnemius (origin from popliteal surface).



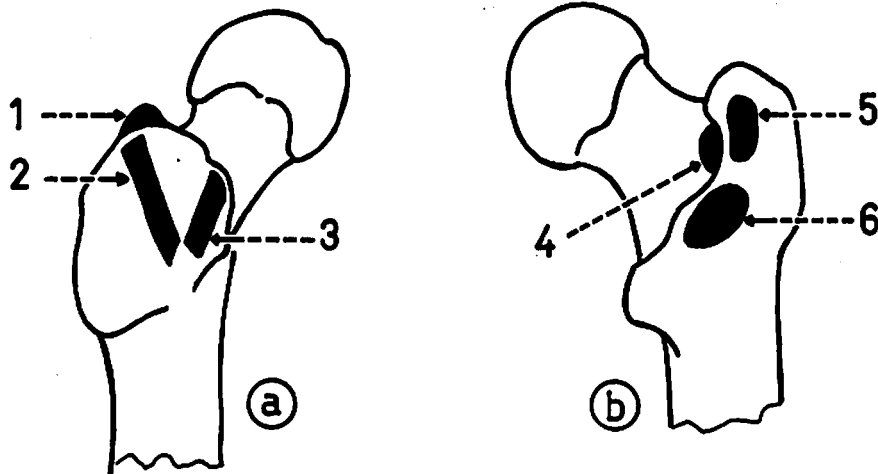


Fig.(30): MUSCLES ATTACHED TO GREATER TROCHANTER

- (a) Anterior and lateral surfaces:
1. insertion of piriformis.
 2. insertion of gluteus medius.
 3. insertion of gluteus minimus.
- (b) Posterior and medial surfaces:
4. insertion of obturator externus.
 5. insertion of obturator internus.
 6. insertion of quadratus femoris.

* All the attachments to the greater trochanter are insertions.

Fig.(31): STRUCTURES ATTACHED TO INTERTROCHANTERIC LINE

1. iliofemoral ligament.
2. uppermost part of vastus lateralis (origin).
3. capsule of hip joint.
4. uppermost part of vastus medialis (origin).

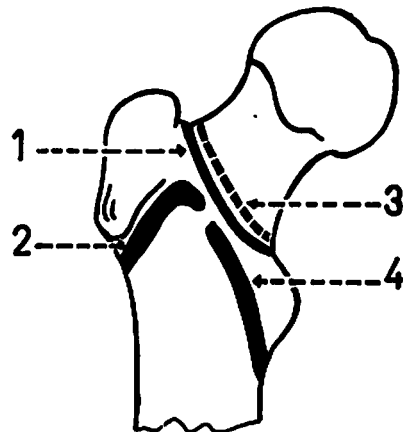


Fig.(32): RELATIONS OF THE BACK OF NECK OF FEMUR

1. capsule of hip joint (attached to the middle of the back of the neck).
2. arrow indicating the position of the tendon of obturator externus (just outside the capsule).

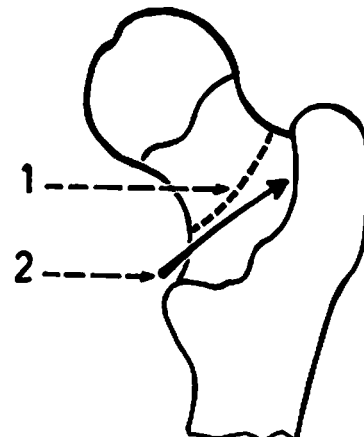


Fig.(33): MUSCLES ATTACHED TO
GLUTEAL TUBEROSITY

1. insertion of uppermost part of adductor magnus.
2. insertion of deep 1/4 of gluteus maximus.
3. origin of upper part of vastus lateralis.

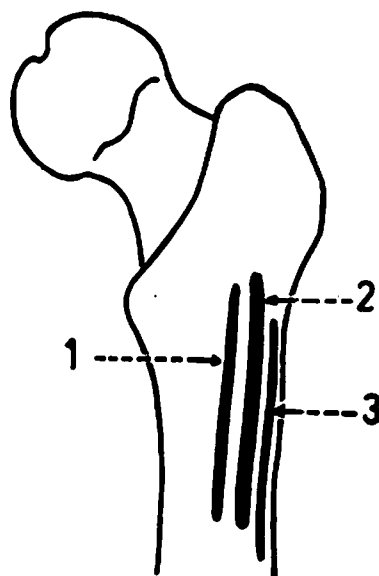


Fig.(34): ARRANGEMENT OF MUSCLE ATTACHMENTS
IN THE UPPER PART OF THE BACK OF
THE SHAFT OF FEMUR

1. insertion of adductor magnus.
2. insertion of pectineus.
3. insertion of adductor brevis.
4. insertion of adductor longus.
5. insertion of gluteus maximus.
6. origin of vastus lateralis.
7. origin of short head of biceps femoris.

* The adductor magnus forms a septum intervening between the pectineus, adductor brevis and adductor longus (in front) and gluteus maximus, short head of biceps and vastus lateralis (behind).

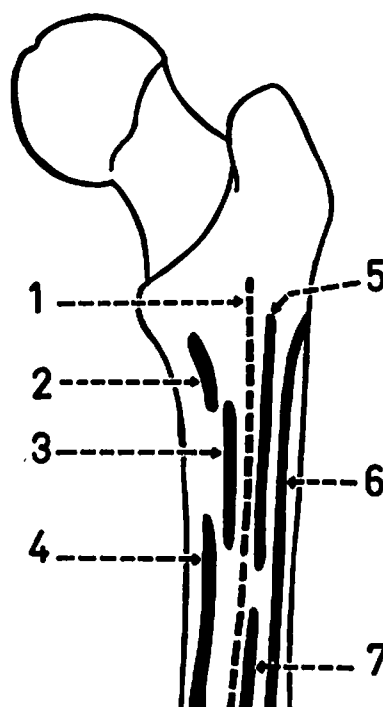


Fig.(35): ARTICULAR SURFACE OF
LOWER END OF FEMUR

1. medial epicondyle.
2. medial condyle.
3. patellar surface (extending more on lateral condyle).
4. lateral epicondyle.
5. lateral condyle..
6. intercondylar fossa or notch.

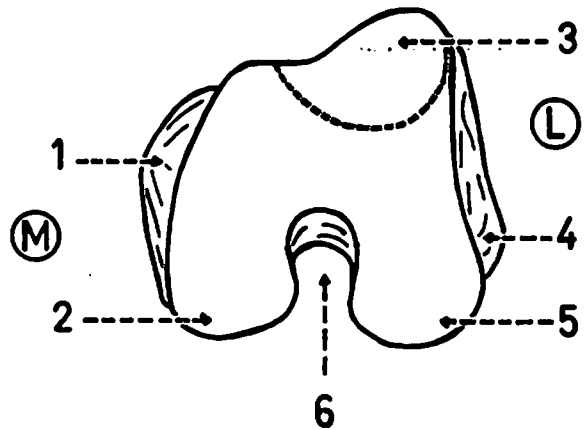


Fig.(36): LATERAL SURFACE OF LOWER
END OF RIGHT FEMUR
(general features)

1. impression for lateral head of gastrocnemius.
2. groove for popliteus.
3. lateral epicondyle.

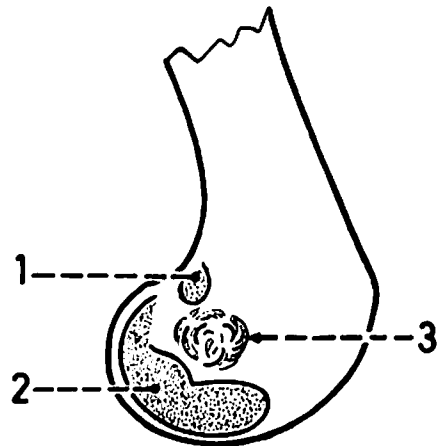


Fig.(37): LATERAL SURFACE OF LOWER
END OF RIGHT FEMUR
(particular features)

1. lateral head of gastrocnemius (origin).
2. fibular collateral ligament (to lateral epicondyle).
3. origin of popliteus (from the groove just below the epicondyle).
4. capsule of knee joint (intervenes between the epicondyle and the groove for popliteus).

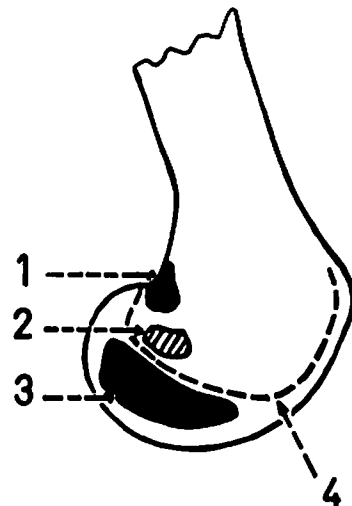


Fig.(38): POSTERIOR SURFACE OF LOWER
END OF RIGHT FEMUR
(general features)

1. adductor tubercle.
2. medial epicondyle.
3. medial condyle.
4. lateral epicondyle.
5. lateral condyle.
6. intercondylar fossa.
7. intercondylar line.

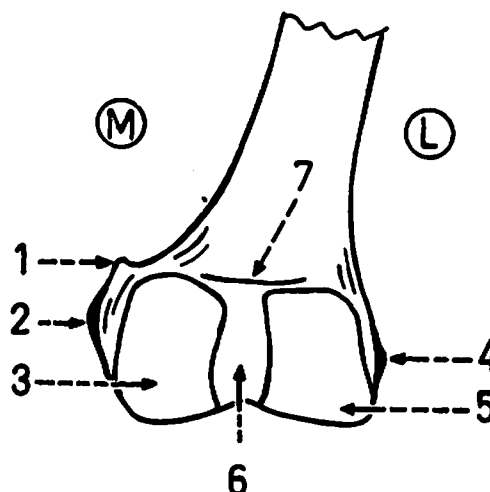


Fig.(39): POSTERIOR SURFACE OF LOWER
END OF RIGHT FEMUR
(particular features)

1. capsule of knee joint (attached to intercondylar line).
2. tibial collateral ligament (to medial epicondyle).
3. posterior cruciate ligament (to intercondylar fossa).
4. oblique popliteal ligament (to intercondylar line).
5. fibular collateral ligament (to lateral epicondyle).
6. anterior cruciate ligament (to intercondylar fossa).

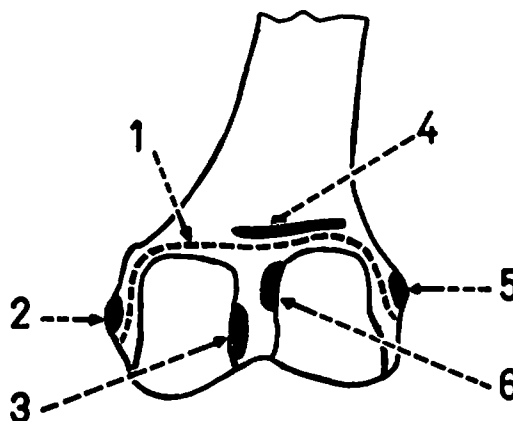


Fig.(40): POSTERIOR SURFACE OF LOWER 1/3
OF THE SHAFT OF RIGHT FEMUR
(particular features)

1. origin of vastus medialis (most medial).
2. insertion of adductor magnus (into . medial supracondylar line and adductor tubercle).
3. origin of short head of biceps femoris (from upper part of lateral supracondylar line).
4. origin of medial head of gastrocnemius.
5. origin of plantaris.

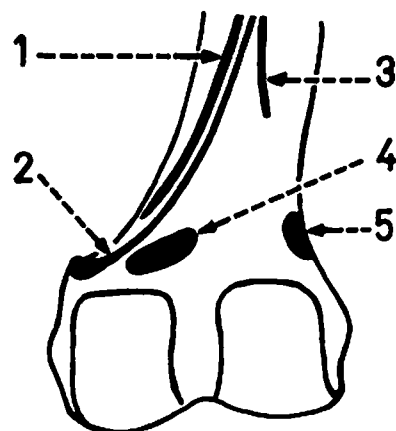


Fig.(41): BLOOD SUPPLY OF HEAD OF FEMUR

The head of the femur gets its blood supply from 2 directions:

- (A) Along the ligament of head of femur from the posterior division of obturator artery and medial circumflex femoral artery.
- (B) Along the neck of femur from the lateral and medial circumflex femoral arteries.

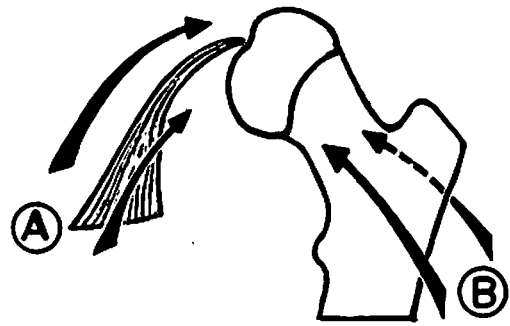
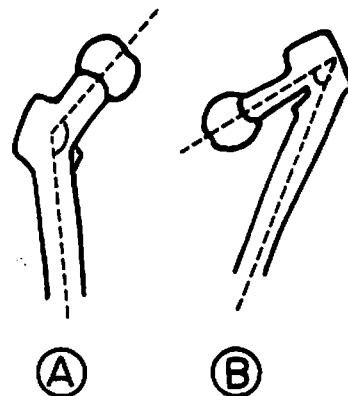


Fig.(42): DEFORMITIES OF NECK OF FEMUR

- (A) Coxa valga: the angle is more than normal (the normal angle is 125°).
- (B) Coxa vara: the angle is less than normal.

* Coxa = hip.



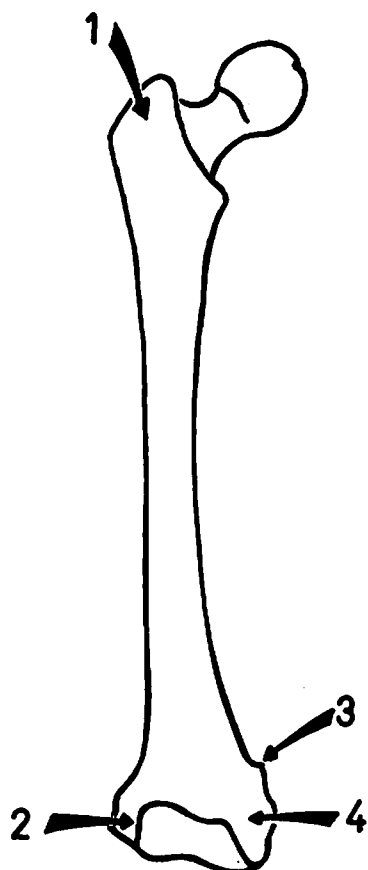


Fig.(43): SUBCUTANEOUS PARTS OF FEMUR

1. greater trochanter (felt a hand's breadth below the tubercle of iliac crest. Its upper border is on level with the centre of the head of femur).
2. lateral condyle and epicondyle.
3. adductor tubercle (the tendon of adductor magnus is a guide to it).
4. medial condyle and epicondyle.

* The shaft as well as the head and neck cannot be felt.

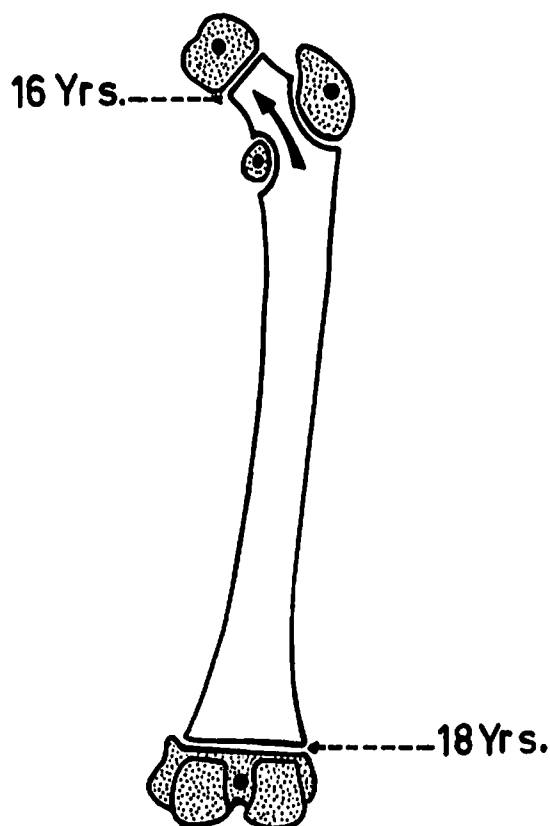


Fig.(44): OSSIFICATION OF FEMUR

- * The secondary centres of ossification appear in the head (at 6th month after birth), in greater trochanter (at 4th year), in lesser trochanter (at 12th year) and in the lower end (at 9th month before birth).
- * The neck ossifies as extension from the shaft.
- * The upper end (head) fuses with the shaft earlier than the lower end.

TIBIA and FIBULA

Fig.(45): ANTERIOR ASPECT
OF LEFT TIBIA
(general features)

1. intercondylar eminence.
2. medial condyle.
3. tuberosity of tibia.
4. medial surface.
5. anterior border (shin of tibia).
6. medial malleolus.
7. lateral condyle.
8. articular facet for the head of fibula.
9. lateral surface (its lower 1/4 is directed anteriorly due to medial deviation of the anterior border).

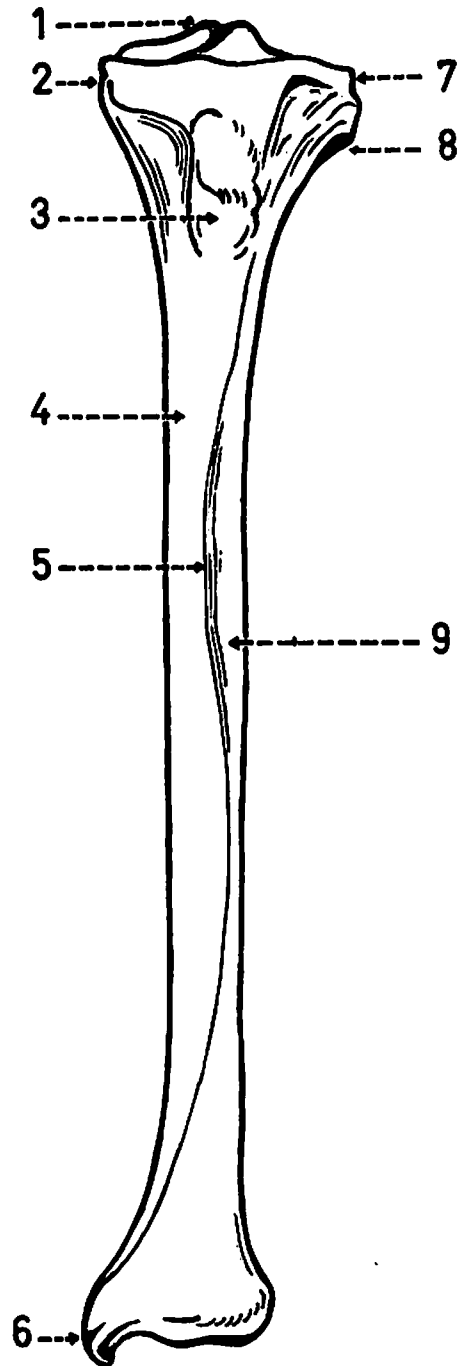


Fig.(46): POSTERIOR ASPECT OF LEFT
TIBIA AND FIBULA
(general features)

1. lateral condyle of tibia.
2. intercondylar eminence.
3. medial condyle of tibia.
4. groove for semimembranosus tendon.
5. popliteal surface (above the soleal line).
6. soleal line.
7. nutrient groove (directed downwards).
8. vertical line (begins near the middle of soleal line and divides the posterior surface into medial and lateral areas).
9. groove for tibialis posterior tendon (on the back of medial malleolus).
10. medial malleolus.
11. groove for peroneus longus and brevis (on the back of lateral malleolus).
12. lateral malleolus (lower end of fibula).
13. head of fibula.

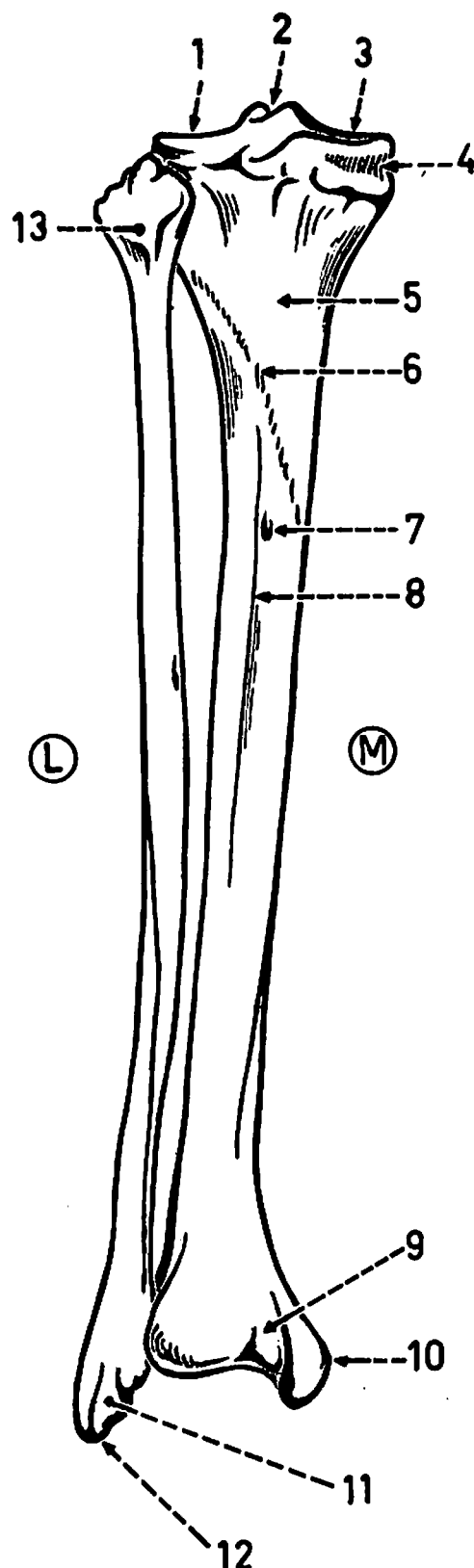


Fig.(47): BORDERS AND SURFACES
OF RIGHT TIBIA
(anterior aspect)

1. tuberosity of tibia.
2. anterior border (extends from tibial tuberosity above to medial malleolus below).
3. medial surface of the shaft (subcutaneous).
4. lateral surface.
5. medial malleolus.
6. rough impression for iliotibial tract.

* The anterior border deviates medially in its lower part to reach the medial malleolus.

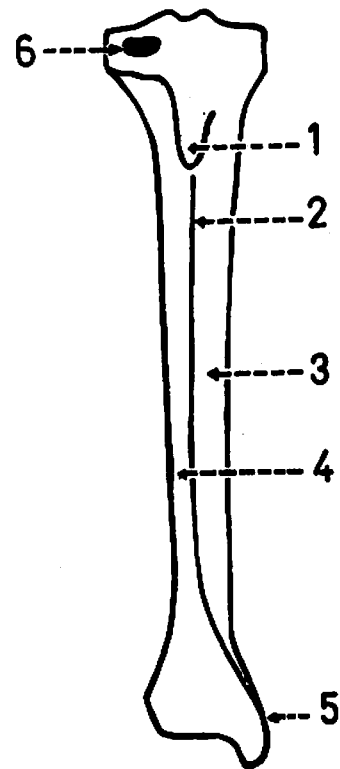
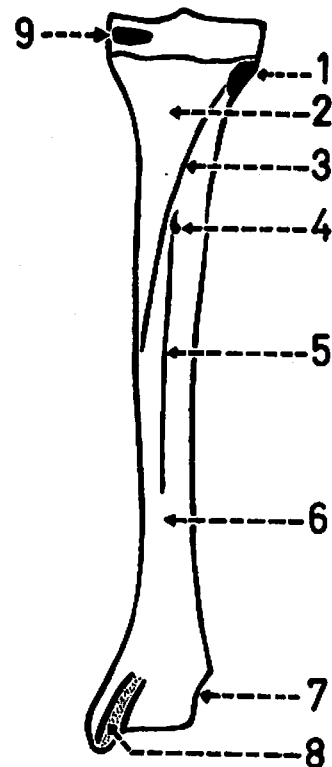


Fig.(48): BORDERS AND SURFACES
OF RIGHT TIBIA
(posterior aspect)

1. fibular facet (for superior tibio-fibular joint).
2. popliteal surface.
3. soleal line (runs downwards and medially to join the medial border).
4. nutrient groove.
5. vertical line (runs vertically on the posterior surface dividing it into 2 longitudinal areas).
6. posterior surface of tibia.
7. fibular notch (for inferior tibio-fibular joint).
8. groove on the back of medial malleolus for tibialis posterior.
9. groove on the back of medial condyle for semimembranosus.



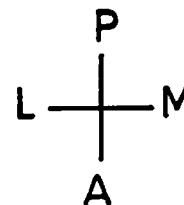
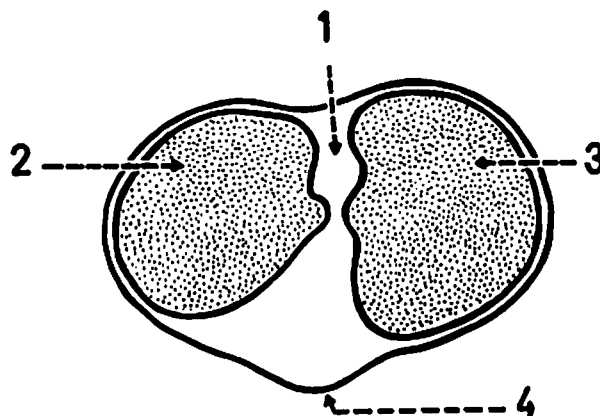


Fig.(49): UPPER SURFACE OF
RIGHT TIBIA
(general features)

This is the upper aspect of the upper end of tibia which is formed of the 2 condyles.



1. intercondylar area (rough non-articular area between the 2 condyles; its middle part is elevated and is called intercondylar eminence; this eminence is divisible into medial and lateral intercondylar tubercles).
2. articular surface of lateral condyle (small and circular).
3. articular surface of medial condyle (larger and oval).
4. tuberosity of tibia.

Fig.(50): UPPER SURFACE OF
RIGHT TIBIA
(particular features)

1. posterior cruciate ligament (most posterior structure).
2. posterior horn of medial meniscus.
3. articular surface of lateral condyle.
4. anterior horn of lateral meniscus.
5. anterior cruciate ligament.
6. anterior horn of medial meniscus.
7. posterior horn of lateral meniscus.
8. articular surface of medial condyle.

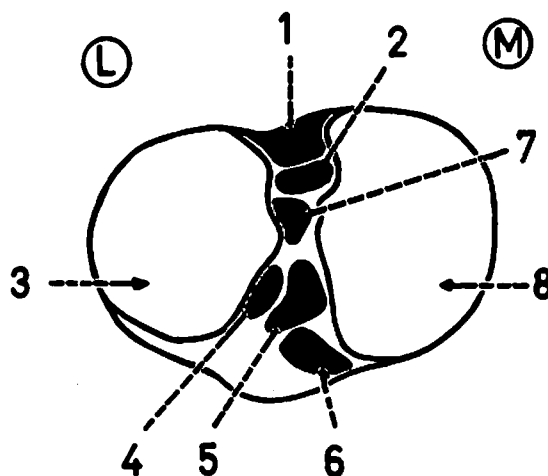


Fig.(51): ANTERIOR ASPECT OF LEFT
TIBIA AND FIBULA
(particular features)

1. ligamentum patellae.
2. tibial collateral ligament (to medial condyle and upper part of medial surface of the shaft of tibia).
3. insertion of gracilis.
4. insertion of semitendinosus.
5. insertion of sartorius.
6. origin of tibialis anterior (from upper 2/3 of lateral surface of tibia).
7. iliotibial tract (on anterior surface of lateral condyle).
8. fibular collateral ligament (to head of fibula).
9. insertion of biceps femoris (into head of fibula).
10. origin of peroneus longus (from upper 2/3 of lateral surface of fibula).
11. origin of extensor digitorum longus (from upper 3/4 of anterior surface of fibula).
12. origin of extensor hallucis longus (from middle 2/4 of anterior surface of fibula).
13. origin of peroneus brevis (from lower 2/3 of lateral surface of fibula).
14. origin of peroneus tertius (from lower 1/4 of anterior surface of fibula).

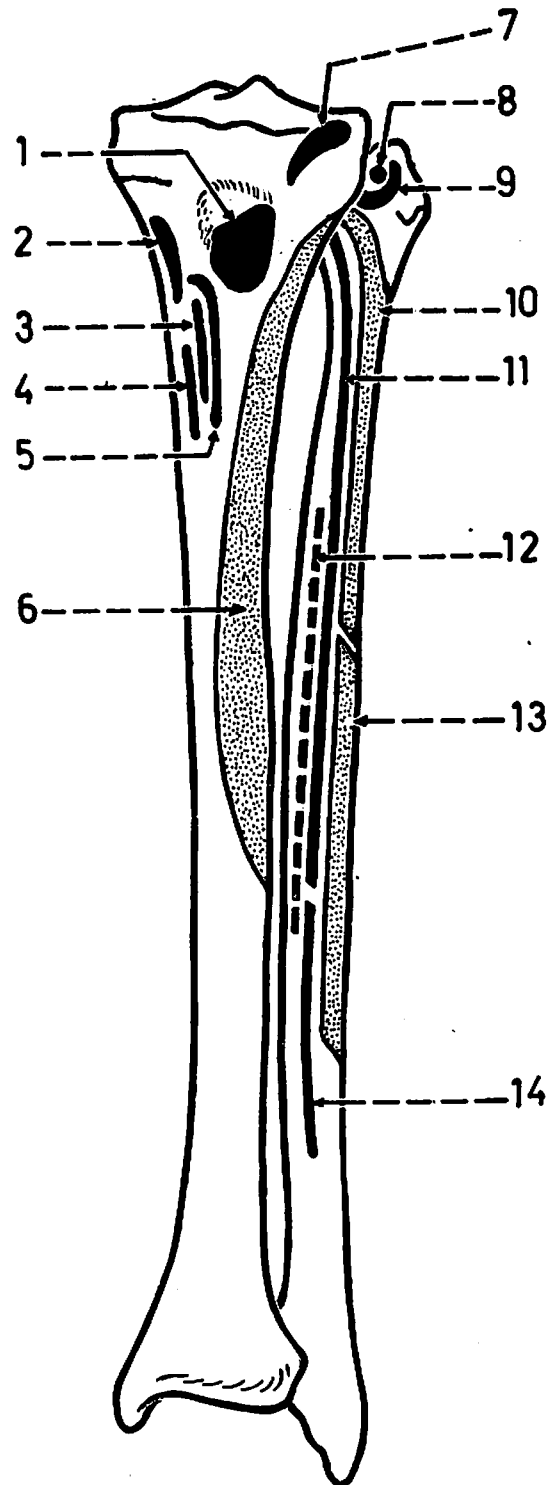


Fig.(52): POSTERIOR ASPECT OF LEFT
TIBIA AND FIBULA
(particular features)

1. fibular origin of soleus
(from upper 1/4 of posterior
surface of fibula).
2. origin of flexor hallucis
longus (from lower 3/4 of
posterior surface of fibula).
3. origin of peroneus brevis (this
origin is seen on the back of
the lower part of the bone due
to lateral twisting of the
fibula).
4. insertion of semimembranosus
(in the groove on the back of
medial condyle of tibia).
5. insertion of popliteus (in
the popliteal surface).
6. tibial origin of soleus (from
the soleal line and middle 1/3
of medial border of tibia).
7. origin of flexor digitorum
longus (from the area medial
to the vertical line).
8. origin of tibialis posterior
(from the area lateral to the
vertical line).

* The lower 1/4 of the tibia
does not give attachment to
muscles, thus it is vulnerable
to avascular necrosis if it is
fractured in its lower part.

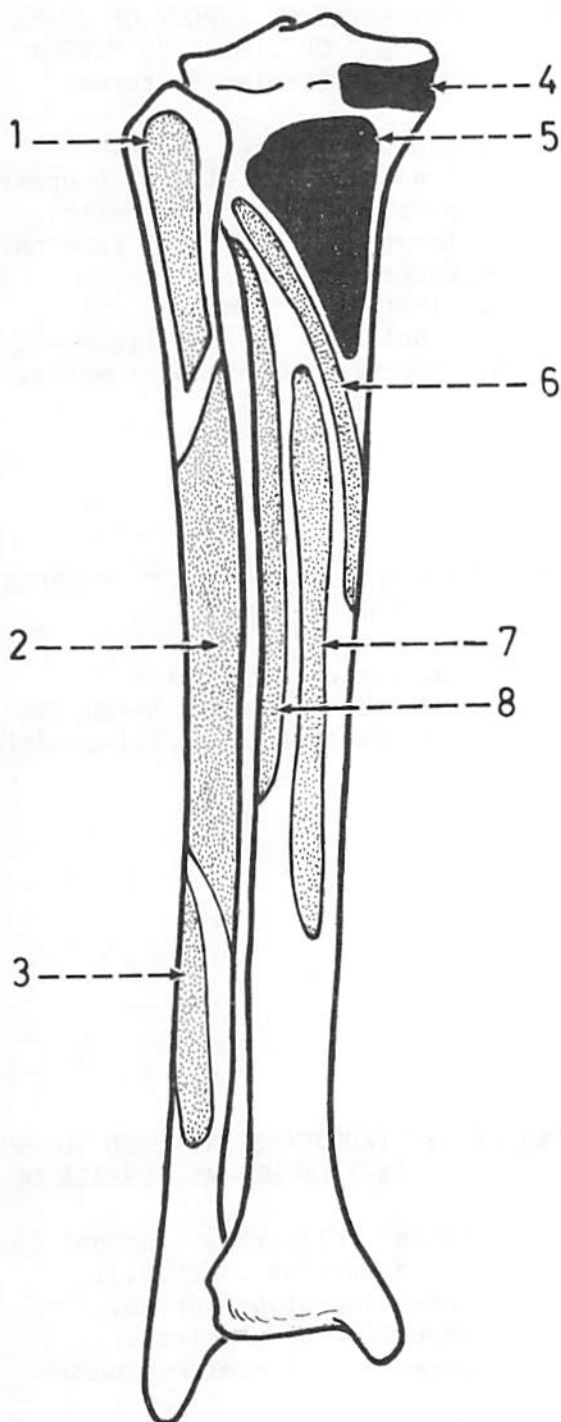


Fig.(53): ANTERIOR ASPECT OF UPPER
END OF TIBIA AND FIBULA
(particular features)

1. capsule of knee joint.
2. ligamentum patellae (to upper part of tibial tuberosity).
3. lower part of tibial tuberosity (subcutaneous).
4. iliotibial tract.
5. fibular collateral ligament.
6. insertion of biceps femoris.

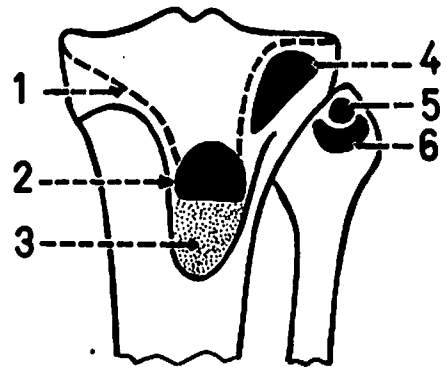


Fig.(54): POSTERIOR ASPECT OF UPPER
END OF TIBIA

1. capsule of knee joint.
2. insertion of semimembranosus (on the back of medial condyle).

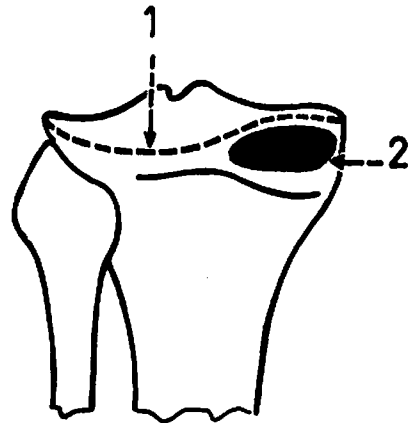


Fig.(55): STRUCTURES ATTACHED TO UPPER
PART OF MEDIAL SURFACE OF TIBIA

1. tibial collateral ligament (behind the 3 muscles, S.G.S.).
2. insertion of sartorius.
3. insertion of gracilis.
4. insertion of semitendinosus.

* The 3 muscles are arranged from before backwards as S.G.S.

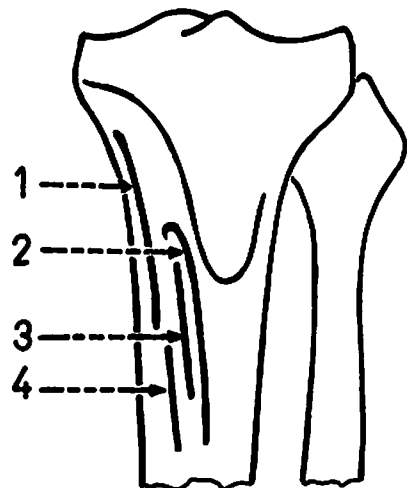


Fig.(56): LOWERMOST PARTS OF ANTERIOR BORDERS OF TIBIA AND FIBULA

1. anterior border of tibia (deviates medially).
2. lower 1/4 of lateral surface of tibia (comes to the front of the lower part of shaft).
3. anterior border of fibula (runs upwards from the apex of a triangular area which is continuous with the lateral surface of lateral malleolus).
4. triangular area on the lateral surface of lateral malleolus.

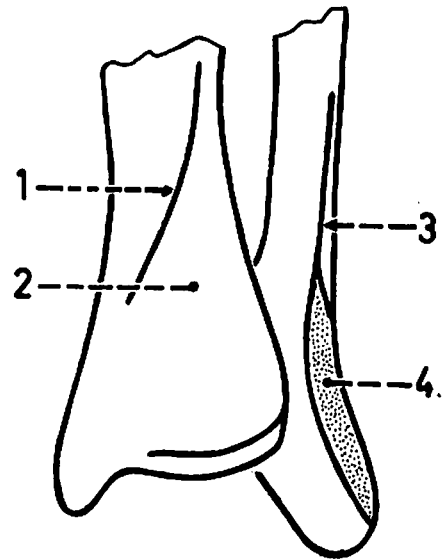


Fig.(57): LIGAMENTS ATTACHED TO LOWER END OF TIBIA AND FIBULA (anterior aspect)

1. deltoid ligament (to the tip of medial malleolus).
2. capsule of ankle joint (close to the articular surface).
3. calcaneo-fibular ligament (to the tip of lateral malleolus).

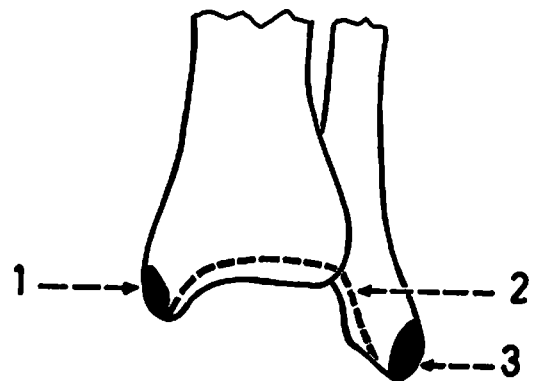


Fig.(58): MEDIAL SURFACE OF LOWER END OF TIBIA TO SHOW LIGAMENTS OF INFERIOR TIBIO-FIBULAR JOINT

This joint is of the fibrous type (syndesmosis).

1. anterior tibio-fibular ligament.
2. interosseous ligament (strong ligament continuous above with the interosseous membrane).
3. posterior tibio-fibular ligament.

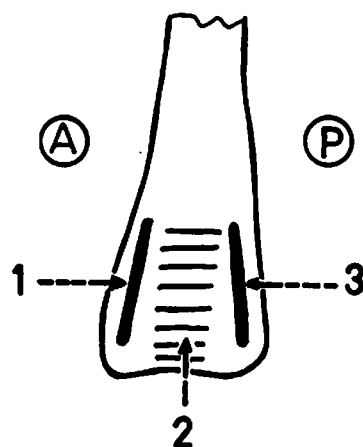


Fig.(59): RIGHT FIBULA
(general features)

(A) Anterior aspect (B) Posterior aspect (C) Lateral aspect

(A) Anterior aspect:

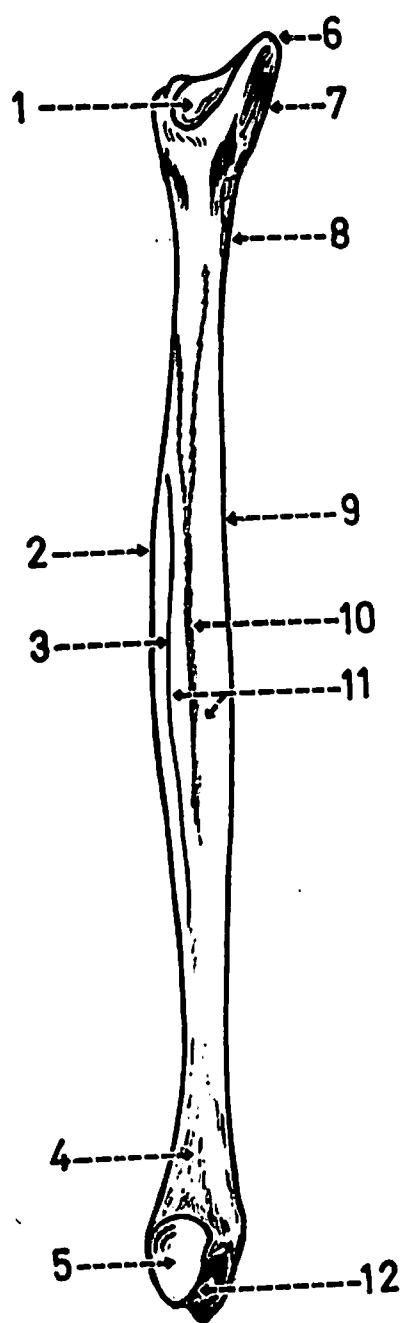
1. facet for superior tibio-fibular joint.
2. anterior border.
3. interosseous border (very close and parallel to the anterior border and is continuous below with the apex of the rough triangular area above the articular facet; the anterior surface is the very narrow strip bounded by the anterior and interosseous borders).
4. rough triangular area for the interosseous ligament of the inferior tibio-fibular joint (lies just above the articular facet).
5. articular facet for the talus (marks the medial aspect of the bone).
6. styloid process or apex of the head of fibula.
7. head of fibula.
8. neck of fibula.
9. posterior border (the posterior surface is bounded by the interosseous and posterior borders and has the medial crest running vertically on it).
10. medial crest (more prominent than the interosseous border and divides the posterior surface into 2 longitudinal areas).
11. posterior surface of fibula.
12. malleolar fossa (deep depression behind the articular facet).

(B) Posterior aspect:

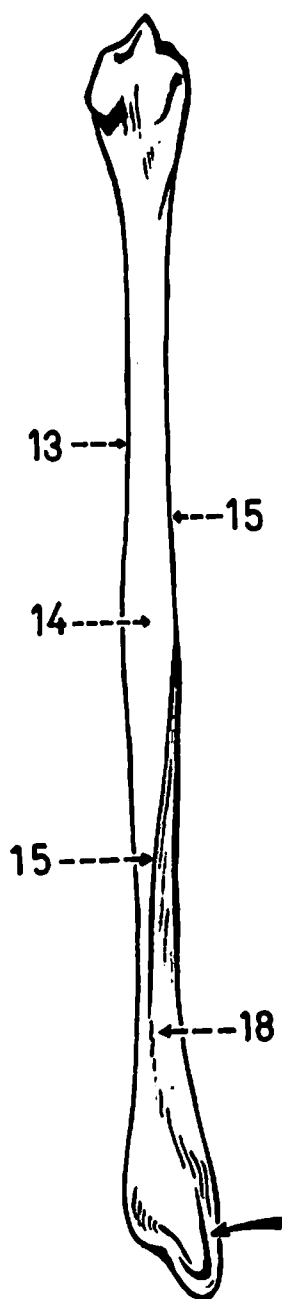
13. medial crest.
14. part of the posterior surface.
15. posterior border (continuous below with the medial margin of the groove on the back of the lateral malleolus which is marked by an arrow).

(C) Lateral aspect:

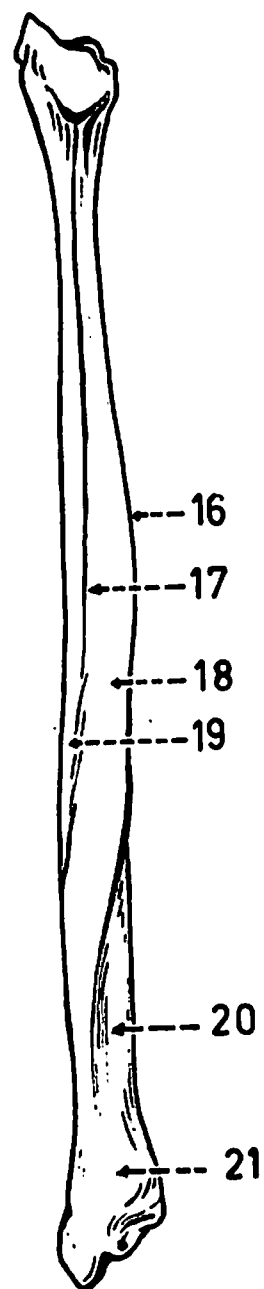
16. anterior border.
17. posterior border (it curves medially in its lower part).
18. lateral surface (between the anterior and posterior borders; it deviates to the posterior aspect in its lower part due to lateral twisting of the fibula).
19. part of posterior surface (behind the posterior border).
20. triangular subcutaneous part.
21. lateral surface of lateral malleolus.



(A)



(B)



(C)

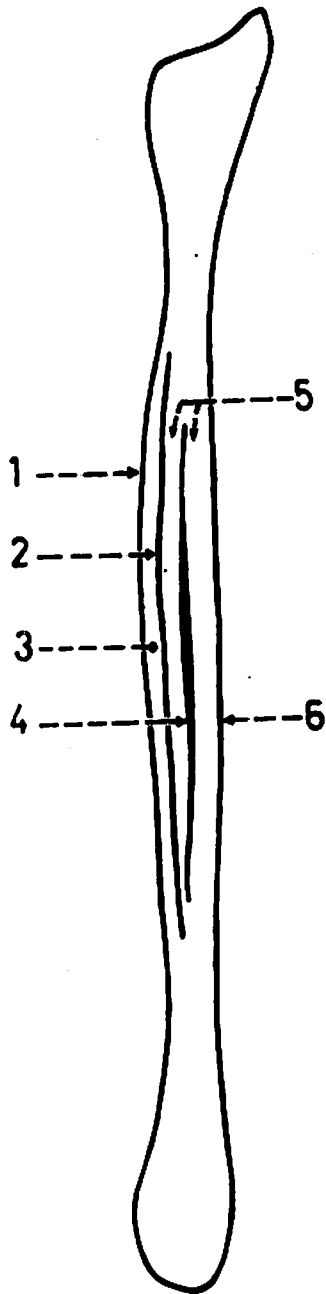


Fig.(60): ANTERIOR ASPECT OF FIBULA
(borders and surfaces)

1. anterior border.
2. interosseous border.
3. anterior or extensor surface.
4. medial crest.
5. posterior surface.
6. posterior border.

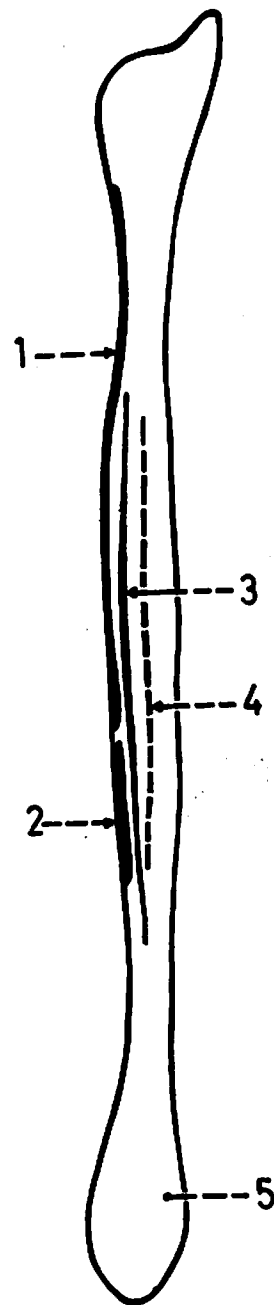


Fig.(61): MUSCLES ATTACHED TO
ANTERIOR SURFACE OF FIBULA

1. origin of extensor digitorum longus (from upper 3/4).
2. origin of peroneus tertius (from lower 1/4).
3. origin of extensor hallucis longus (from middle 2/4).
4. interosseous border.
5. lateral malleolus.

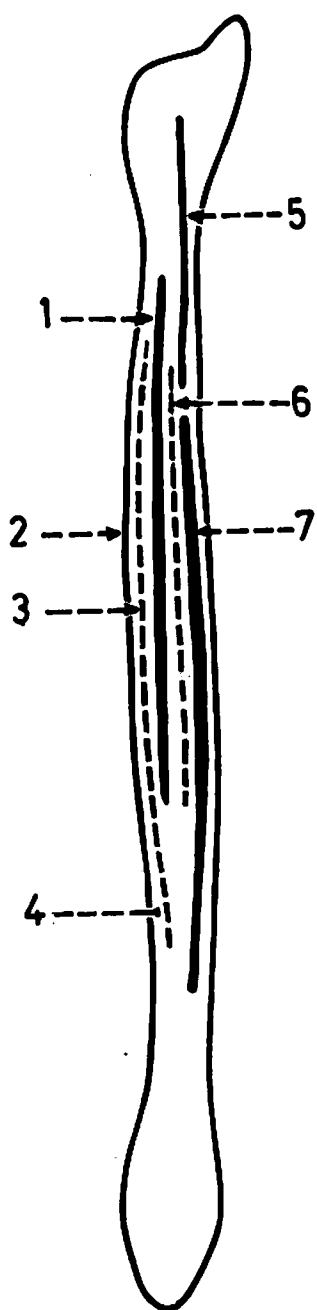


Fig.(62): MUSCLES ATTACHED TO POSTERIOR SURFACE OF FIBULA

1. origin of tibialis posterior.
2. anterior border.
3. interosseous border.
4. anterior surface.
5. fibular origin of soleus.
6. medial crest.
7. origin of flexor hallucis longus.

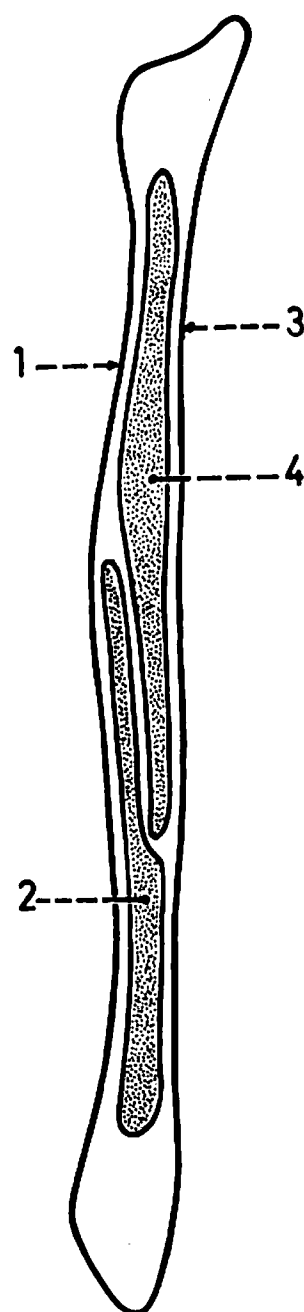


Fig.(63): MUSCLES ATTACHED TO LATERAL SURFACE OF FIBULA

1. anterior border.
2. origin of peroneus brevis (from lower 2/3).
3. posterior border.
4. origin of peroneus longus (from upper 2/3).

Fig.(64): MUSCLE GROUPS RELATED
TO FIBULA
(cross-section in right leg)

1. one of the extensor muscles (in anterior compartment).
2. peroneal muscles (in lateral compartment).
3. fibula.
4. flexor hallucis longus (in posterior compartment).
5. tibialis posterior (in posterior compartment).

* The 3 surfaces of the fibula are related to the 3 compartments of the leg.

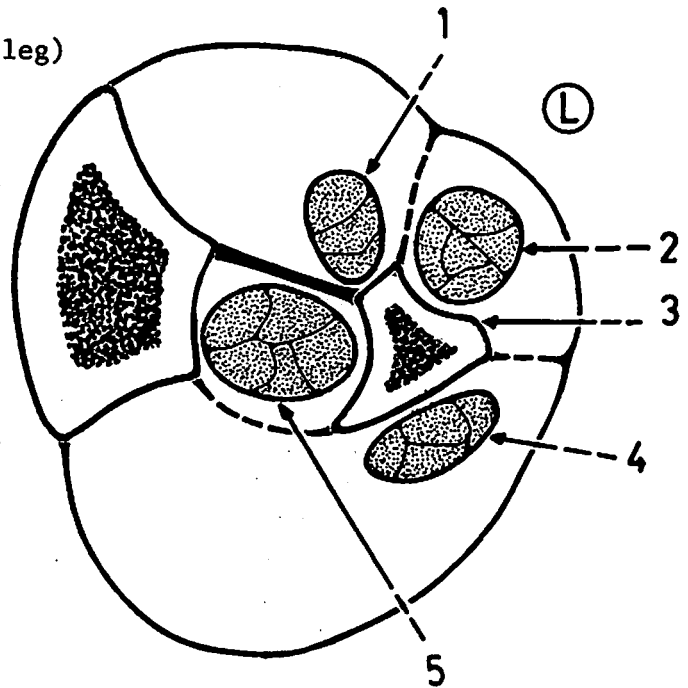
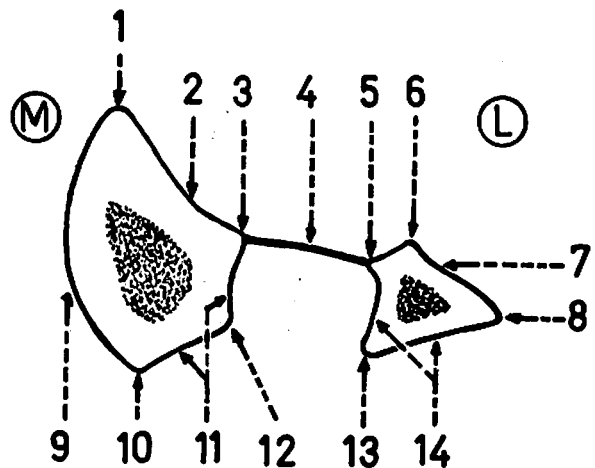


Fig.(65): CROSS-SECTION IN RIGHT TIBIA AND FIBULA
(borders and surfaces)

1. anterior border of tibia.
2. lateral surface of tibia.
3. interosseous border of tibia.
4. interosseous membrane.
5. interosseous border of fibula.
6. anterior border of fibula (the anterior surface is bounded by the anterior and interosseous borders).
7. lateral surface of fibula.
8. posterior border of fibula.
9. medial surface of tibia.
10. medial border of tibia.
11. posterior surface of tibia.
12. vertical ridge on posterior surface of tibia.
13. medial crest on posterior surface of fibula.
14. posterior surface of fibula.

* The posterior surface of tibia is divided by the vertical ridge into 2 areas, and the posterior surface of the fibula is divided by the medial crest into 2 areas.



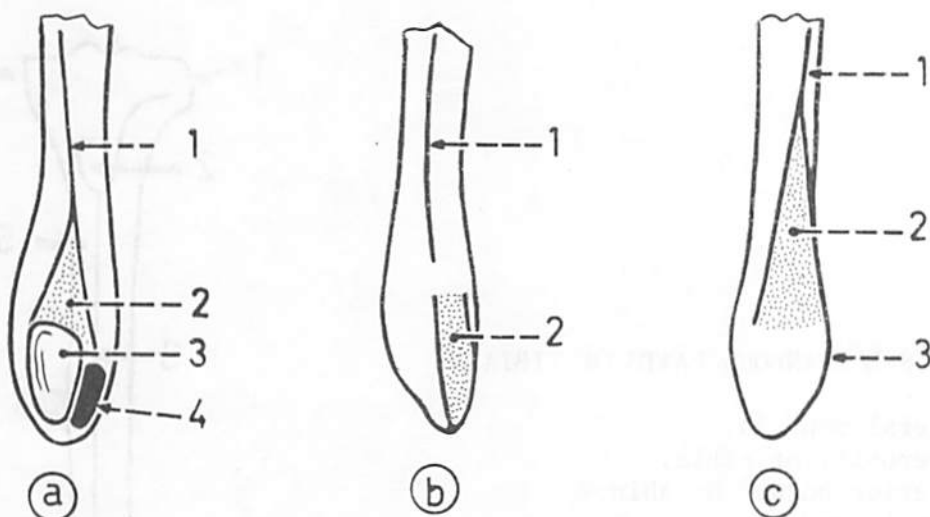


Fig.(66): THE 3 BORDERS OF RIGHT FIBULA AT ITS LOWER END

- (a) Interosseous border: it ends at the rough triangular area just above the articular facet.

1. interosseous border; 2. rough triangular area;
3. articular facet for talus; 4. malleolar fossa (behind the articular facet).

- (b) Posterior border: it ends at the medial margin of the groove for the peroneus longus and brevis.

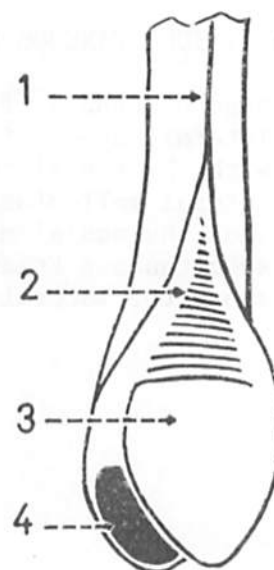
1. posterior border; 2. groove for the 2 peronei.

- (c) Anterior border: it ends at the smooth triangular area on the lateral surface.

1. anterior border; 2. smooth triangular area on lateral surface;
3. lateral malleolus.

Fig.(67): MEDIAL SURFACE OF LOWER END OF LEFT FIBULA

1. interosseous border (better identified from below).
2. rough triangular area just above the articular facet (for the ligaments of inferior tibio-fibular joint).
3. articular facet for articulation with the talus.
4. malleolar fossa (behind the facet, for the posterior tibio-fibular and posterior talo-fibular ligaments).



* The malleolar fossa and the facet are important in identifying the side of the bone.

Fig.(68): SUBCUTANEOUS PARTS OF TIBIA

1. lateral condyle.
2. tuberosity of tibia.
3. anterior border or shin.
4. medial condyle.
5. the whole medial surface.
6. medial malleolus.

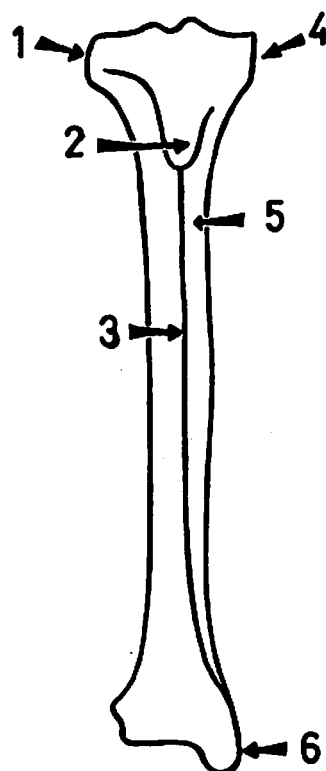
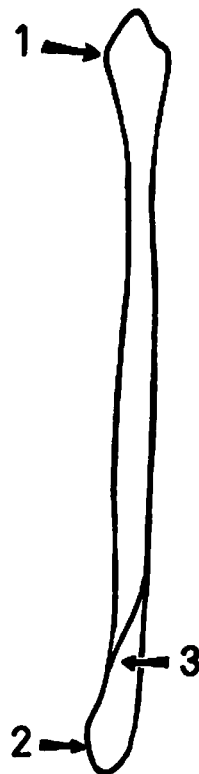


Fig.(69): SUBCUTANEOUS PARTS OF FIBULA .

1. head of fibula (felt on the postero-lateral aspect of the knee on level with the tibial tuberosity).
2. lateral malleolus (it is 1 cm lower than the medial malleolus).
3. subcutaneous triangular area just above the lateral malleolus.



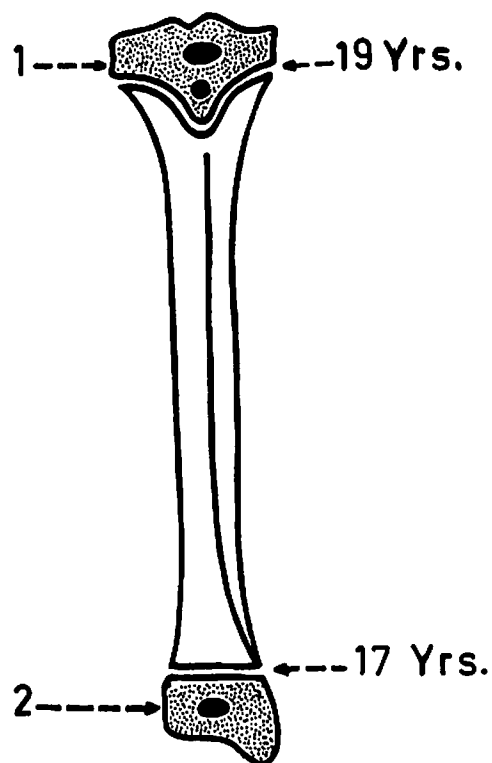


Fig.(70): OSSIFICATION OF TIBIA

1. upper end (the centre of ossification appears at the time of birth).
 2. lower end (the centre of ossification appears at the 1st year).
- * The tibial tuberosity ossifies from a special centre or by downward extension from the upper end.

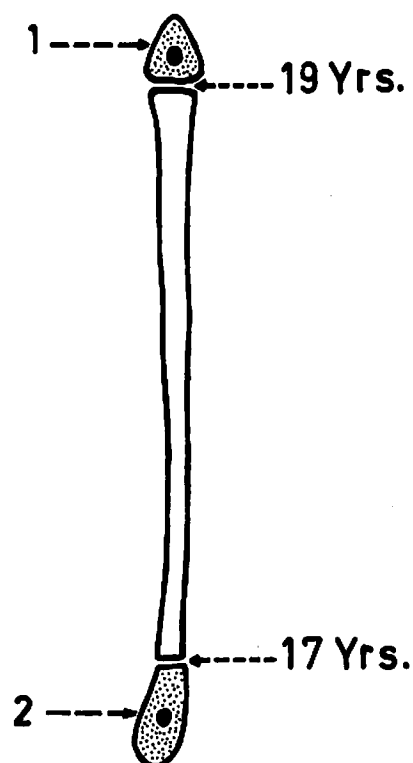


Fig.(71): OSSIFICATION OF FIBULA

1. upper end (the centre of ossification appears at the 4th year).
 2. lower end (the centre of ossification appears at the 1st year).
- * The lower end of fibula ossifies earlier than the upper end, and it fuses with the shaft earlier than the upper end. This is the reverse of the rule in all other long bones where the epiphysis which appears earlier fuses with the shaft later.

PATELLA

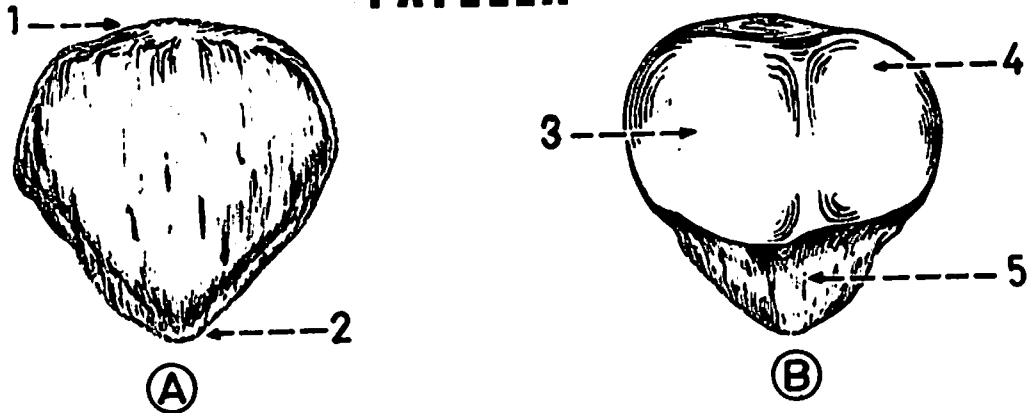


Fig.(72): LEFT PATELLA
(general features)

(A) Anterior aspect:

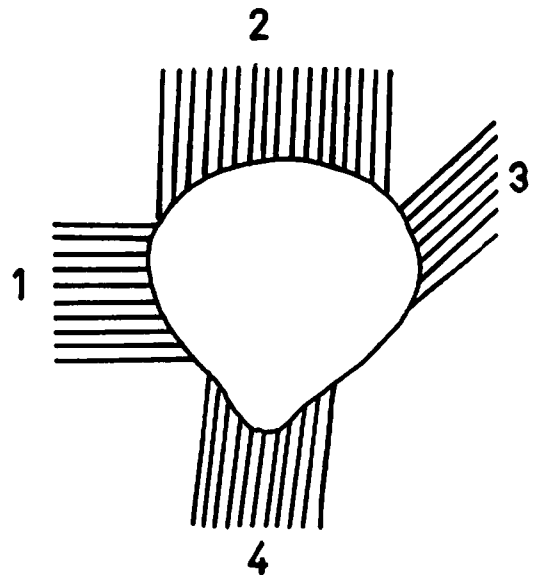
1. base of patella (superior border).
2. apex of patella (directed downwards).

(B) Posterior aspect:

3. facet for lateral condyle of femur (large).
4. facet for medial condyle of femur (smaller).
5. area for attachment of ligamentum patellae.

Fig.(73): STRUCTURES ATTACHED TO
PATELLA

1. horizontal lower fibres of vastus medialis (into medial border).
2. common tendon of quadriceps femoris (into the base).
3. oblique lower fibres of vastus lateralis (into lateral border).
4. ligamentum patellae (into the apex and lower part of posterior surface).



FOOT

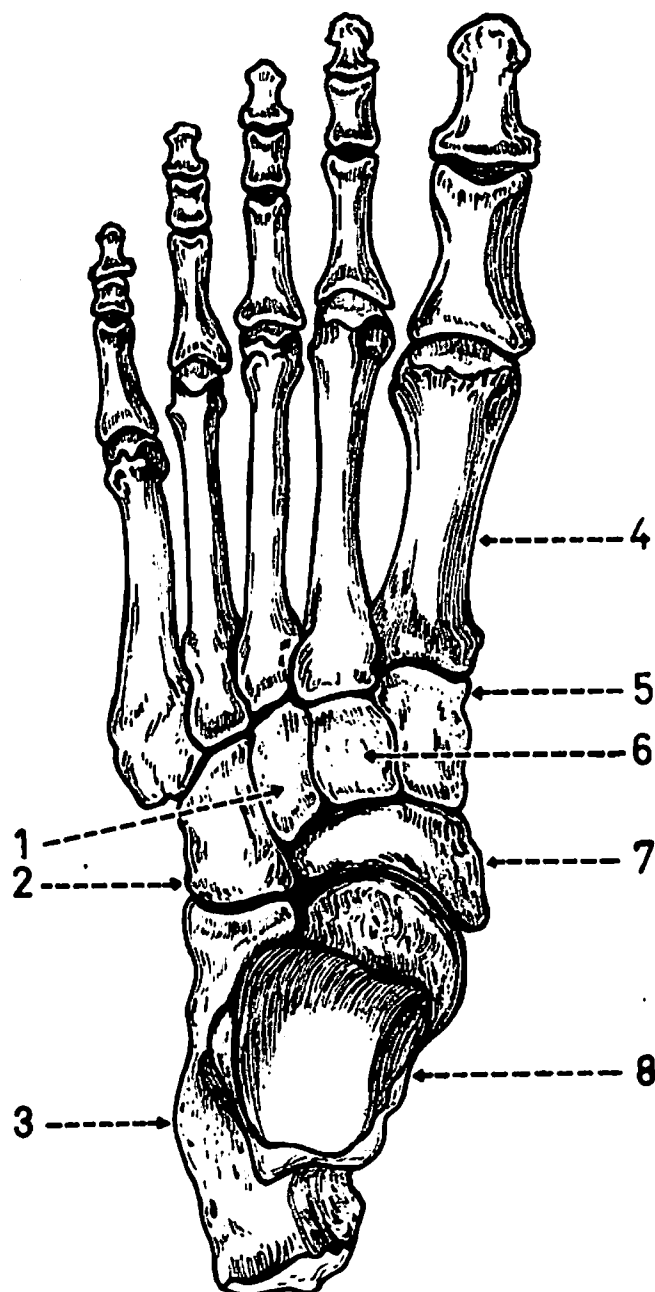


Fig.(74): DORSAL ASPECT OF LEFT FOOT
(general features)

1. lateral cuneiform.
2. cuboid.
3. calcaneus.
4. 1st metatarsal.

5. medial cuneiform.
6. intermediate cuneiform.
7. navicular.
8. talus.

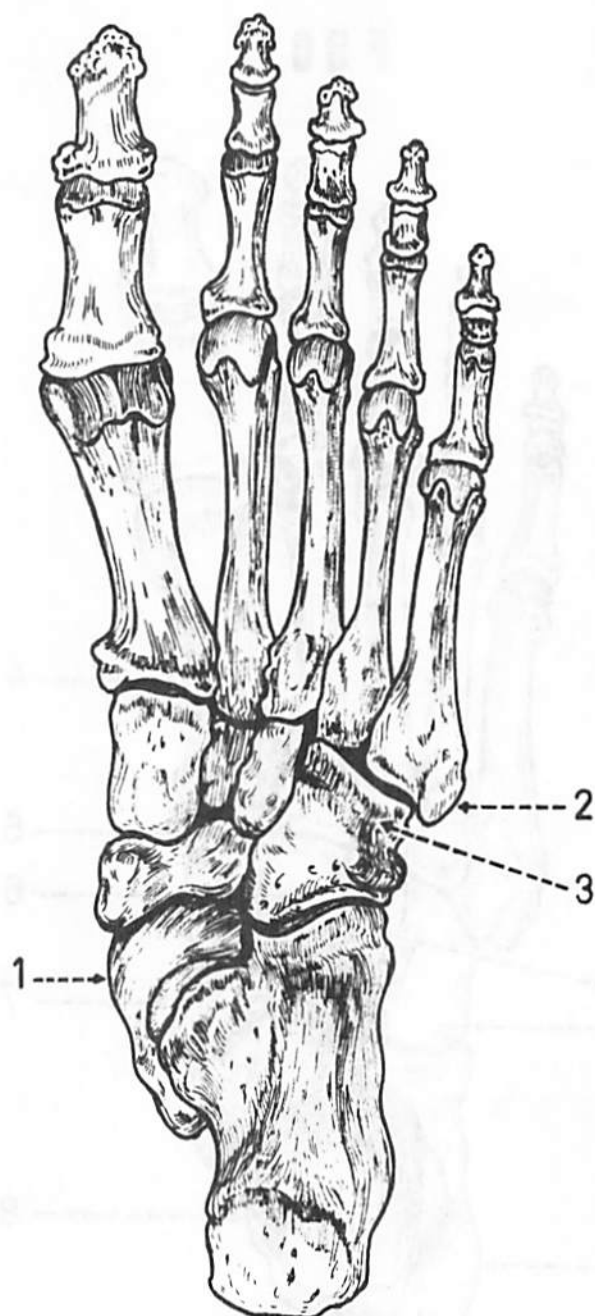


Fig.(75): PLANTAR ASPECT OF LEFT FOOT
(general features)

1. head of talus.
2. tuberosity on the base of 5th metatarsal.
3. groove on the plantar surface of cuboid.

Fig.(76): DORSAL ASPECT OF LEFT FOOT
(particular features)

1. insertion of extensor digitorum longus (through extensor expansion).
2. insertion of extensor digitorum longus (through extensor expansion).
3. insertion of an interosseous muscle.
4. insertion of abductor digiti minimi.
5. origin of 4th dorsal interosseous.
6. insertion of peroneus tertius.
7. insertion of peroneus brevis.
8. origin of extensor digitorum brevis.
9. insertion of extensor hallucis longus.
10. insertion of extensor hallucis brevis.
11. insertion of abductor hallucis.
12. origin of 1st dorsal interosseous.
13. insertion of tendo-calcaneus.

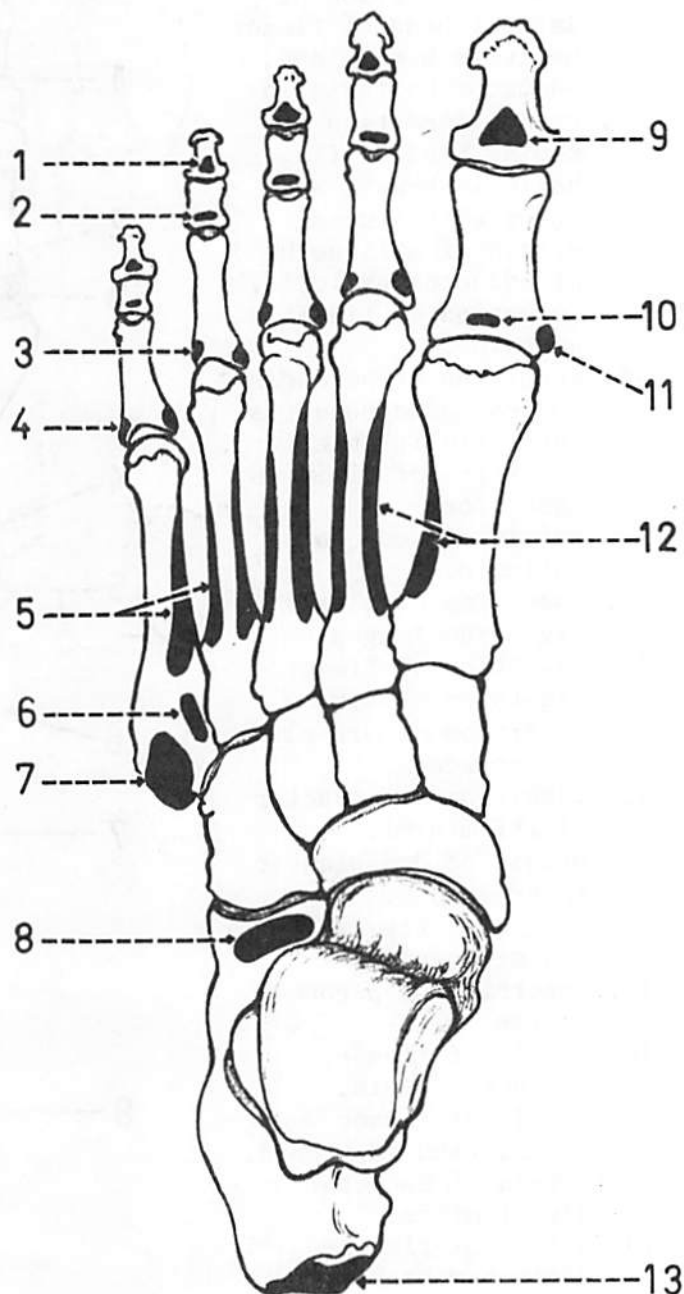


Fig.(77): PLANTAR ASPECT OF LEFT FOOT
(particular features)

1. insertion of flexor hallucis longus.
2. common insertion of lateral head of flexor hallucis brevis and adductor hallucis.
3. common insertion of medial head of flexor hallucis brevis and abductor hallucis.
4. origin of oblique head of adductor hallucis.
5. insertion of tibialis anterior.
6. insertion of peroneus longus (same bones as for tibialis anterior).
7. insertion of tibialis posterior.
8. origin of abductor hallucis.
9. insertion of flexor digitorum longus.
10. insertion of flexor digitorum brevis.
11. insertion of 3rd plantar interosseous.
12. insertion of abductor digiti minimi.
13. origin of 3rd plantar interosseous.
14. origin of flexor digiti minimi brevis.
15. insertion of peroneus brevis.
16. origin of flexor hallucis brevis.
17. origin of flexor accessorius (2 heads).
18. origin of abductor digiti minimi.
19. origin of flexor digitorum brevis.

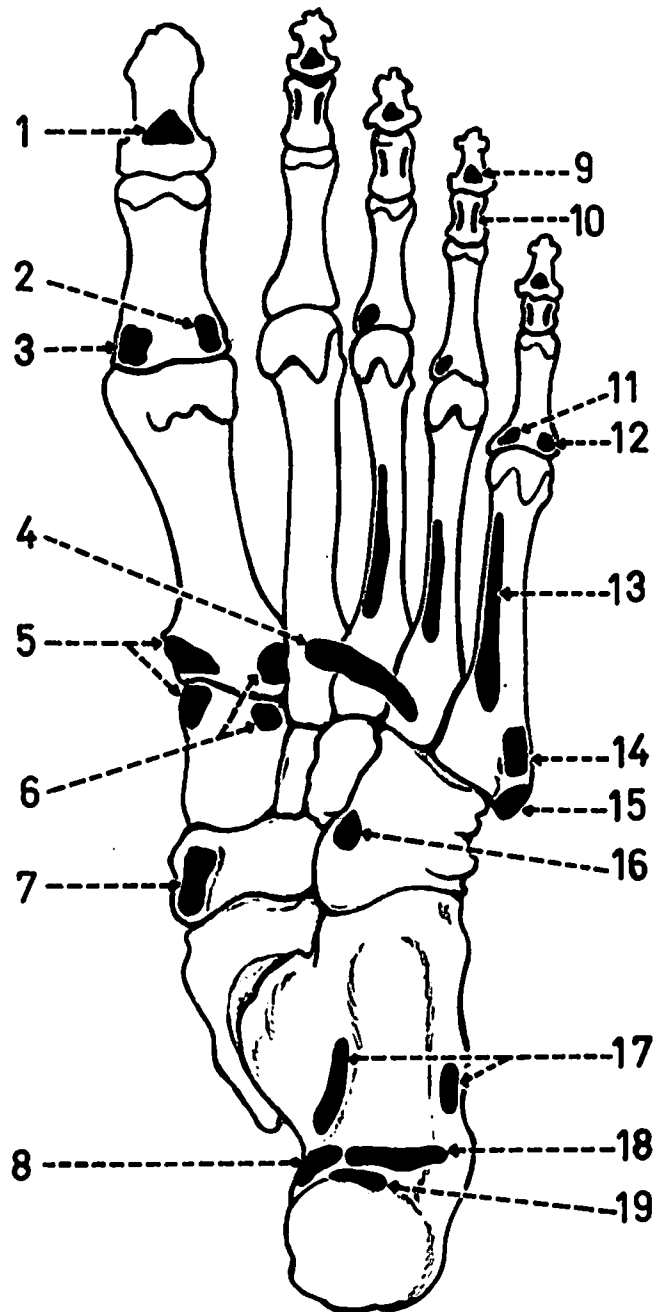


Fig.(78): LONGITUDINAL ARCHES
OF FOOT
(dorsal aspect)

1. medial longitudinal arch:
formed by calcaneus, talus,
navicular, 3 cuneiform and
medial 3 metatarsals.
2. lateral longitudinal arch:
formed by calcaneus, cuboid
and lateral 2 metatarsals.

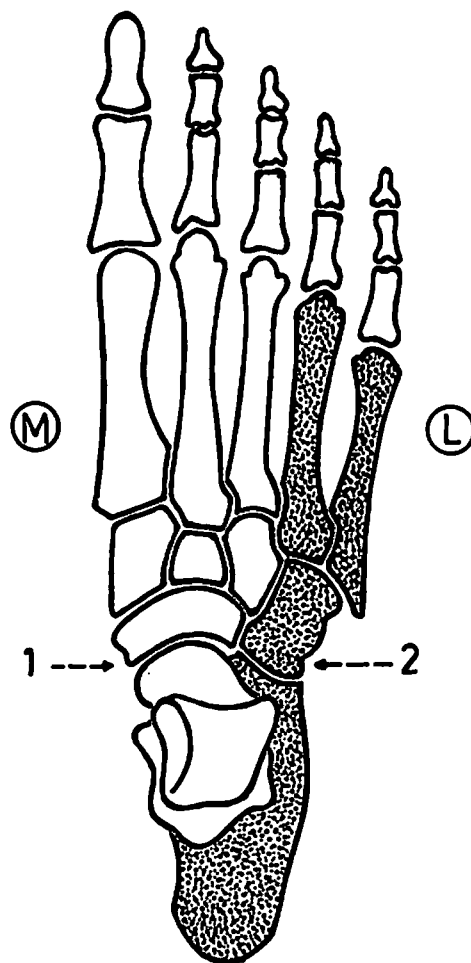


Fig.(79): MEDIAL LONGITUDINAL ARCH
(side view)

1. 1st metatarsal.
2. medial cuneiform.
3. navicular.
4. talus (highest point).
5. calcaneus.

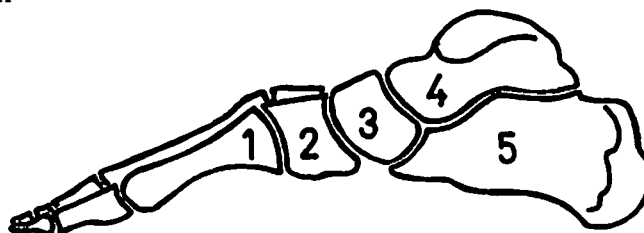
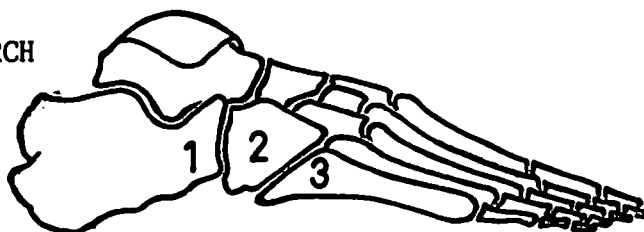


Fig.(80): LATERAL LONGITUDINAL ARCH
(side view)

1. calcaneus.
2. cuboid.
3. 5th metatarsal.



* The lateral longitudinal arch
is less arched than the medial
one.

Fig.(81): TARSAL BONES

The tarsal bones are arranged in 2 rows:
proximal and distal.

1. distal row: formed by the 3 cuneiform bones and the cuboid.
2. proximal row: formed by the navicular, talus and calcaneus.

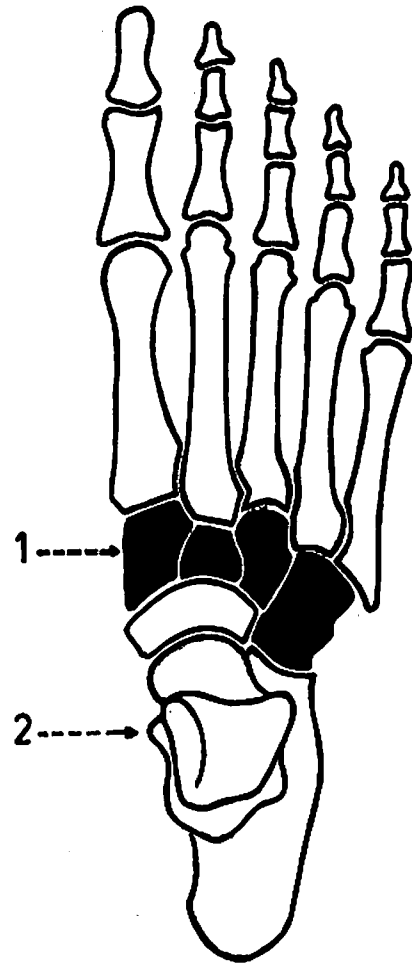
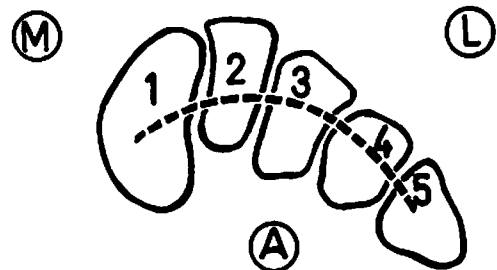


Fig.(82): TRANSVERSE ARCH OF THE FOOT

The transverse arch is formed by
the bases of all metatarsal bones
and the distal row of tarsal bones.

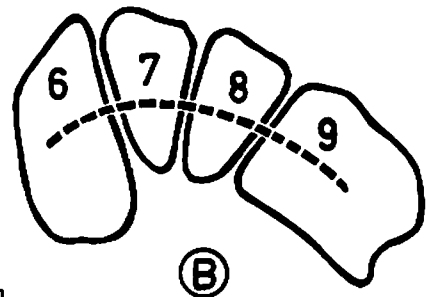
- (A) Cross-section through bases
of metatarsal bones:

1. base of 1st metatarsal.
2. base of 2nd metatarsal.
3. base of 3rd metatarsal.
4. base of 4th metatarsal.
5. base of 5th metatarsal.



- (B) Cross-section through distal
row of tarsal bones:

6. medial cuneiform.
7. intermediate cuneiform.
8. lateral cuneiform.
9. cuboid.



- * The 3 cuneiform bones are wedge-shaped.
The plantar surface of medial cuneiform
forms the base of the wedge while the
dorsal surfaces of the intermediate and
lateral cuneiform are the larger and form
the base of the wedge. This helps in
formation of the transverse arch.

Fig.(83): LEFT CALCANEUS
(dorsal aspect)

1. posterior calcaneal facet.
2. peroneal trochlea.
3. anterior calcaneal facet.
4. middle calcaneal facet.
5. sulcus calcanei (corresponds to the sulcus tali on the plantar surface of talus).

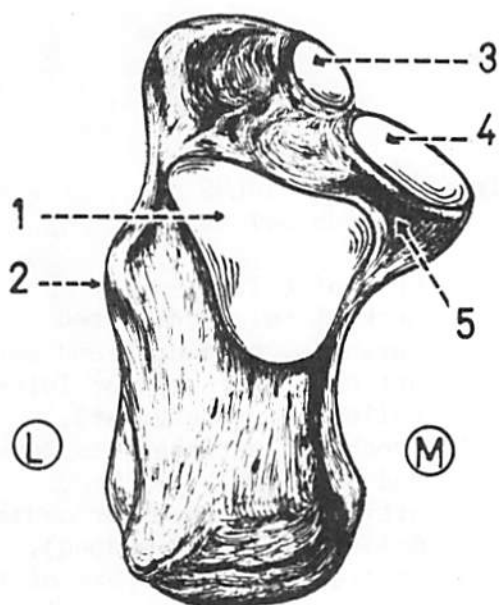


Fig.(84): LEFT CALCANEUS
(plantar aspect)

1. sustentaculum tali (supports the head of talus).
2. groove for flexor hallucis longus (on the under surface of sustentaculum tali).
3. medial process of calcaneal tuberosity.
4. articular facet for cuboid bone.
5. peroneal trochlea.
6. lateral process of calcaneal tuberosity.

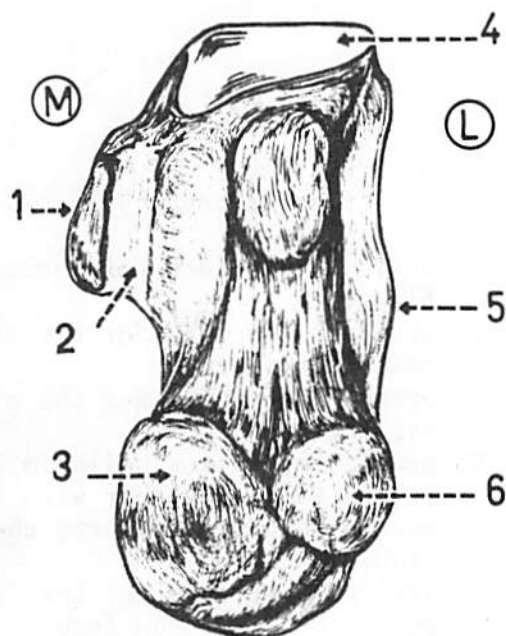


Fig.(85): LEFT TALUS
(dorsal aspect)

1. head of talus.
2. neck of talus (directed forwards, downwards and medially).
3. articular surface for lateral malleolus (triangular).
4. trochlear surface (for lower end of tibia).
5. articular surface for medial malleolus (comma-shaped).
6. lateral tubercle (part of the posterior process of talus).
7. groove for flexor hallucis longus.
8. medial tubercle (part of the posterior process of talus).

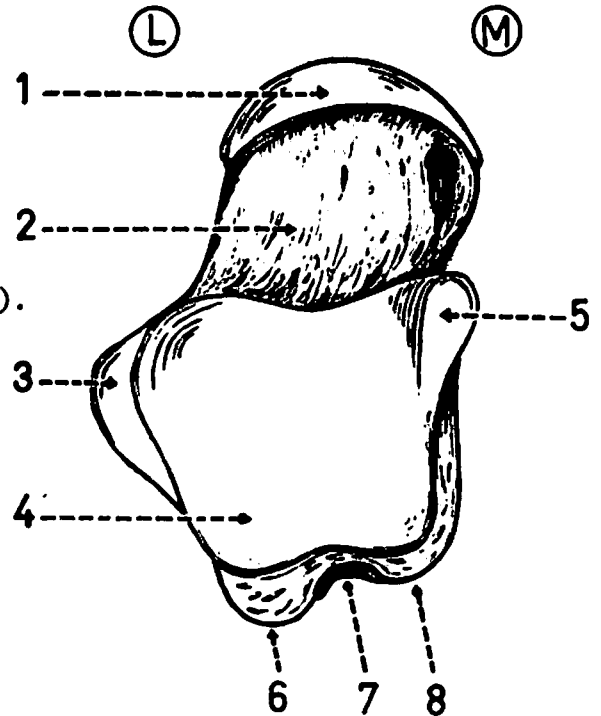


Fig.(86): LEFT TALUS
(plantar aspect)

1. articular surface for navicular bone.
2. articular surface for the anterior calcaneal facet.
3. articular surface for the middle calcaneal facet.
4. groove for flexor hallucis longus.
5. sulcus tali (together with the sulcus calcanei it forms the sinus tarsi).
6. articular surface for the posterior calcaneal facet.

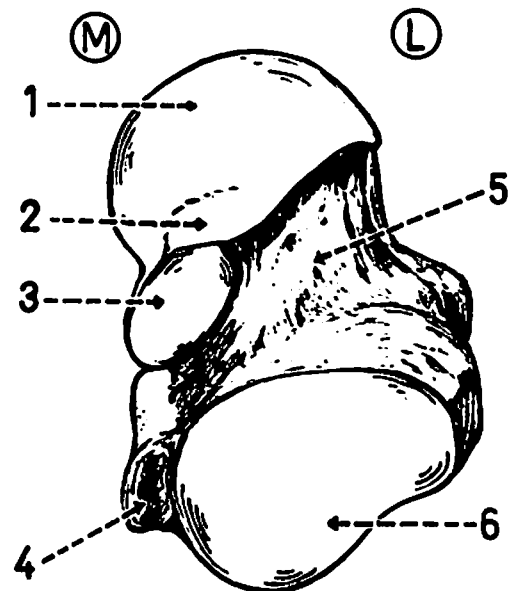


Fig.(87): JOINTS RELATED TO TALUS

These are: ankle, talo-calcaneo-navicular and talo-calcanean.

1. ankle joint (with tibia and fibula).
2. talo-calcaneo-navicular joint (with navicular and calcaneus).
3. talo-calcanean or subtalar joint (with calcaneus only).

* The talus is devoid of muscle attachments but receives attachments of strong ligaments.

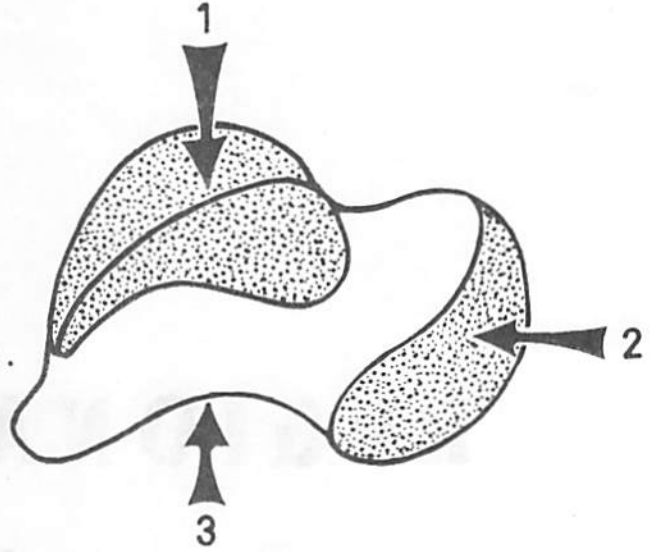
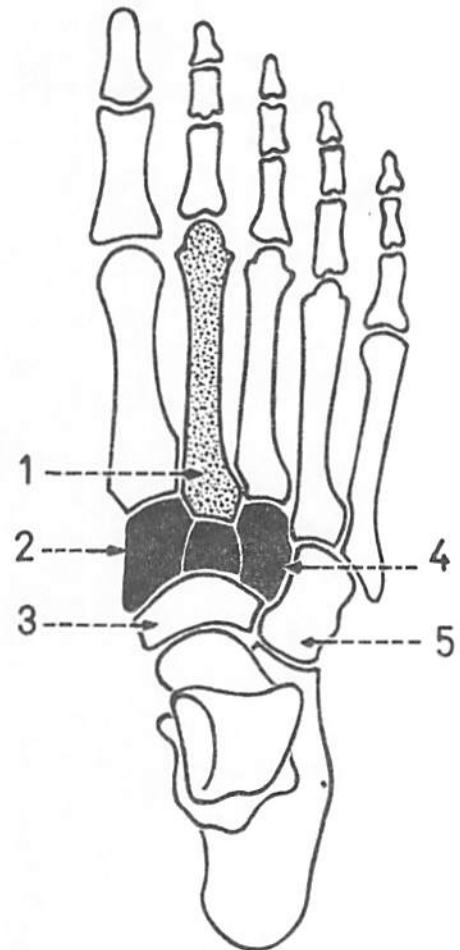


Fig.(88): ARTICULATION OF BASE OF 2nd METATARSAL BONE

The 2nd metatarsal is the longest of all metatarsal bones and its base is fixed in a depression formed by the protruding medial and lateral cuneiform bones.

1. base of 2nd metatarsal.
2. medial cuneiform.
3. navicular.
4. lateral cuneiform.
5. cuboid.



REGIONAL ANATOMY

FRONT OF THIGH

Fig.(89): SUPERFICIAL FASCIA OF THIGH (L.S.)

It consists of a superficial fatty layer and a deep membranous layer. These 2 layers are continuous with the corresponding layers of the anterior abdominal wall.

1. space deep to the membranous layer of superficial fascia of anterior abdominal wall.
2. fatty layer of superficial fascia of anterior abdominal wall.
3. skin of the front of thigh (continuous with that of the abdominal wall at the groin which is marked by an arrow).
4. aponeurosis of external oblique muscle of abdomen (ends below in the inguinal ligament which is marked by an arrow).
5. site of fusion of the membranous layer of superficial fascia of thigh and deep fascia of thigh just below the inguinal ligament.
6. deep fascia of thigh (fascia lata).
7. space deep to the membranous layer of superficial fascia of thigh.

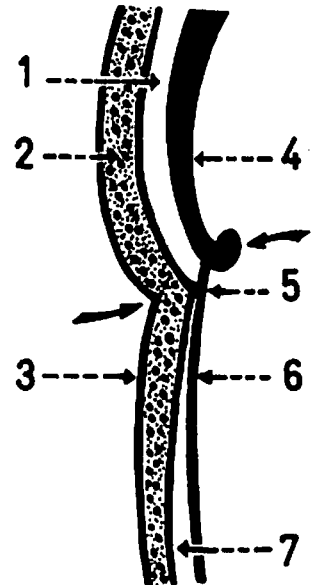


Fig.(90): FLOW OF URINE FROM RUPTURED MALE URETHRA

In rupture urethra urine ascends from the perineum to the anterior abdominal wall deep to the membranous layer of superficial fascia. It is prevented from descending into the thigh by the fusion between the membranous layer and the deep fascia of thigh just below the inguinal ligament.

1. inguinal ligament.
2. line of fusion between membranous layer and deep fascia of thigh.
3. attachment of the membranous layer of superficial fascia of the perineum to the pubic arch.
4. penile urethra in the perineum.

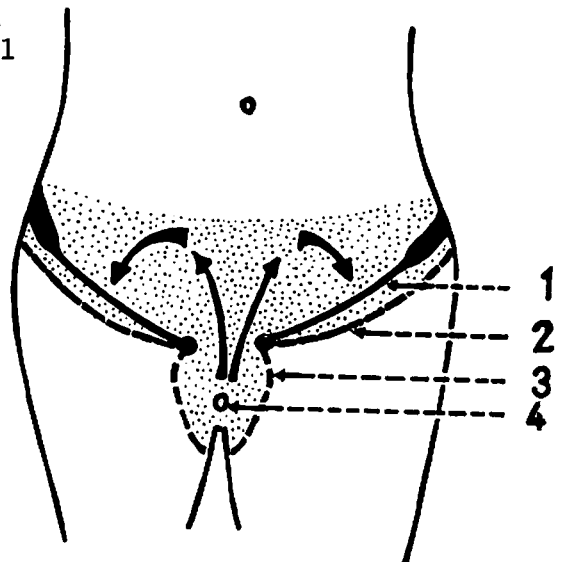


Fig.(91): CUTANEOUS NERVES IN THE FRONT OF THIGH

They are derived from: femoral nerve, obturator nerve and directly from the lumbar plexus.

1. femoral branch of genitofemoral nerve (from lumbar plexus).
2. superficial inguinal ring.
3. ilioinguinal nerve (from lumbar plexus).
4. medial cutaneous nerve of thigh (from femoral).
5. intermediate cutaneous nerve of thigh (from femoral).
6. cutaneous branch of obturator nerve.
7. infrapatellar branch of saphenous nerve (from femoral).
8. femoral nerve.
9. lateral cutaneous nerve of thigh (from lumbar plexus).

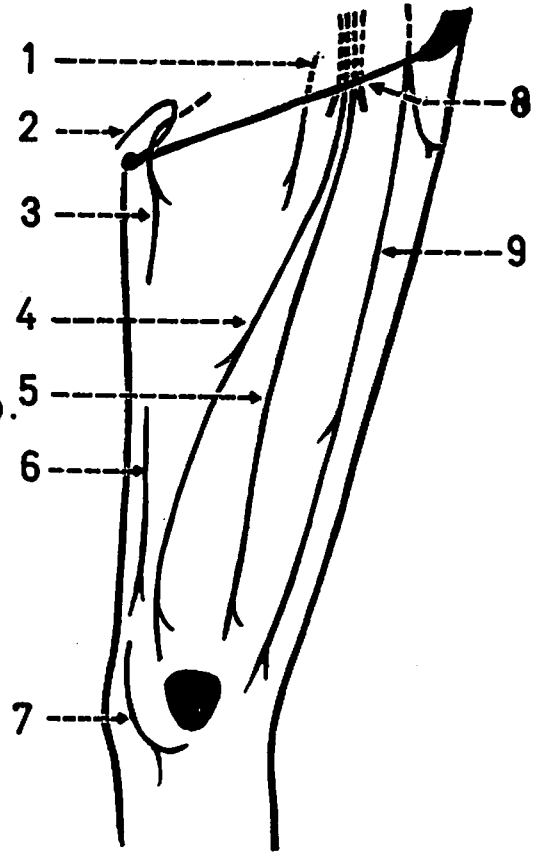
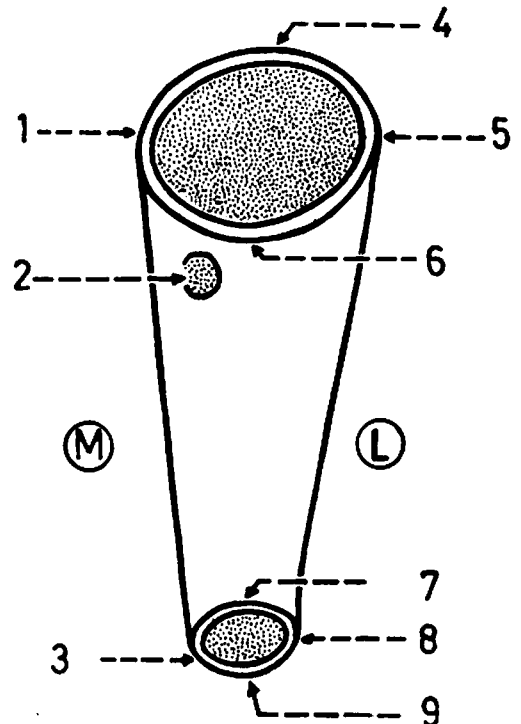


Fig.(92): DEEP FASCIA OF THIGH

It is called fascia lata (lata = wide spread), and surrounds the thigh like a stocking extending from the root of the limb above to the knee below.

1. medial attachment at the root of the limb.
2. saphenous opening (deficiency in the deep fascia).
3. medial attachment at the knee.
4. posterior attachment at the root of the limb.
5. lateral attachment at the root of the limb.
6. anterior attachment to the inguinal ligament.
7. anterior attachment to the patella.
8. lateral attachment at the knee,
9. posterior attachment at the knee where it forms the roof of the popliteal fossa.



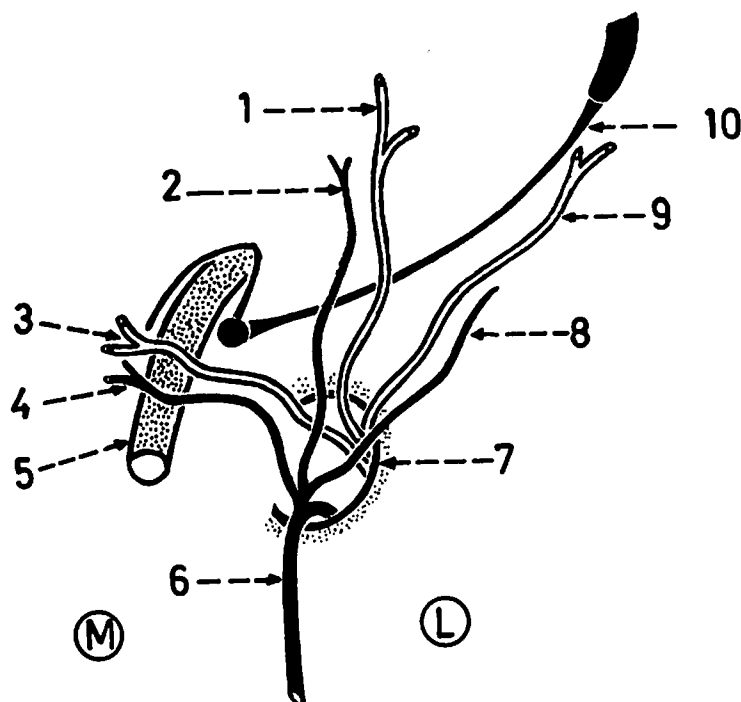


Fig.(93): STRUCTURES PASSING THROUGH SAPHENOUS OPENING

The roof of saphenous opening is formed by cribriform fascia which is perforated by the great saphenous vein and superficial inguinal arteries in addition to lymph vessels.

- | | |
|--|---|
| 1. superficial epigastric artery. | 6. great saphenous vein. |
| 2. superficial epigastric vein. | 7. margin of saphenous opening. |
| 3. superficial external pudendal artery. | 8. superficial circumflex iliac vein. |
| 4. superficial external pudendal vein. | 9. superficial circumflex iliac artery. |
| 5. spermatic cord. | 10. inguinal ligament. |

* The superficial inguinal veins do not pass through the saphenous opening, but they end in the great saphenous vein.

Fig.(94): SAPHENOUS OPENING

It is an opening in the deep fascia of thigh 4 cm below and lateral to the pubic tubercle.

1. inguinal ligament.
2. femoral canal (exposed in the opening).
3. great saphenous vein (hooking round the lower margin of the opening).
4. crescentic margin of saphenous opening.
5. femoral vein (exposed in the opening).

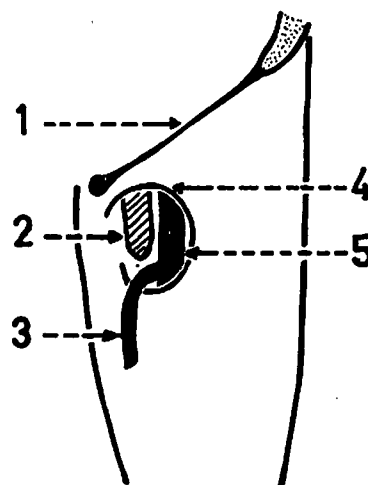


Fig.(95): ILIOTIBIAL TRACT

It is a thickened band of deep fascia on the lateral side of thigh. It extends from the iliac crest above to the lateral condyle of tibia below.

1. iliac crest.
2. tensor fasciae latae muscle.
3. iliotibial tract.
4. lateral condyle of tibia.
5. superficial 3/4 of gluteus maximus.

* The iliotibial tract receives the insertion of 2 muscles: tensor fasciae latae and gluteus maximus.

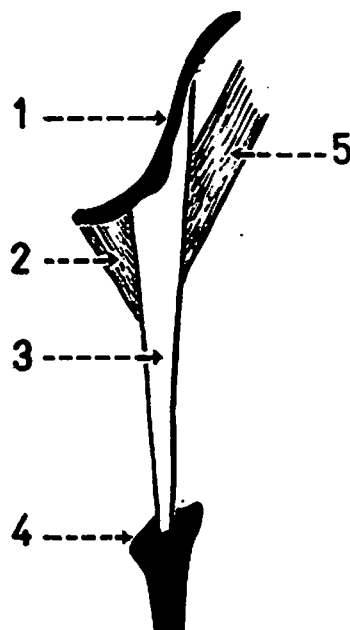
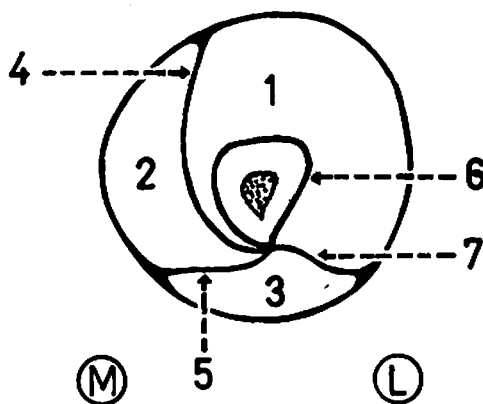


Fig.(96): INTERMUSCULAR SEPTA OF THIGH

These are 3 septa which extend from the deep surface of the fascia lata to the linea aspera of femur. They divide the thigh into 3 compartments.

1. anterior compartment of thigh.
2. medial compartment of thigh.
3. posterior compartment of thigh.
4. medial septum.
5. posterior septum (the thinnest).
6. shaft of femur (T.S.).
7. lateral septum (the strongest).



FEMORAL TRIANGLE

Fig.(97): BOUNDARIES OF FEMORAL TRIANGLE

The femoral triangle is bounded by: inguinal ligament (above), medial border of sartorius (laterally) and medial border of adductor longus (medially).

1. inguinal ligament (base of the triangle).
2. medial border.
3. apex of the triangle.
4. adductor or subsartorial canal.
(begins at the apex of the triangle).
5. femoral triangle (in the upper 1/3 of the front of thigh).
6. lateral border.

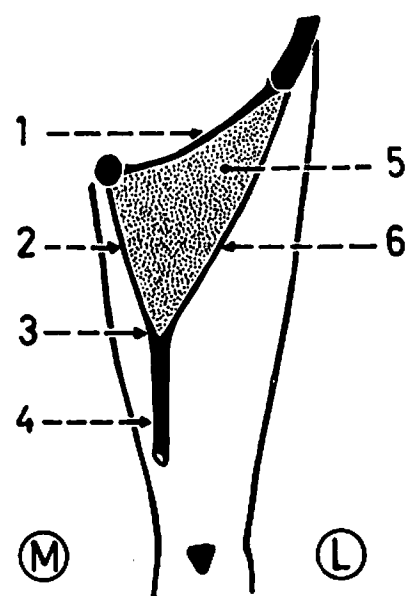


Fig.(98): FEMORAL TRIANGLE IN CROSS-SECTION

The triangle has a roof and a floor: the roof is formed by skin and fasciae while the floor is formed by muscles and slopes from each side towards the centre.

1. roof of the triangle.
2. femoral nerve.
3. femoral and profunda arteries.
4. floor of the triangle (sloping from each side).
5. femoral vein.
6. femoral canal.

* The femoral nerve, femoral vessels, femoral canal and deep inguinal lymph nodes are the main contents of the triangle.

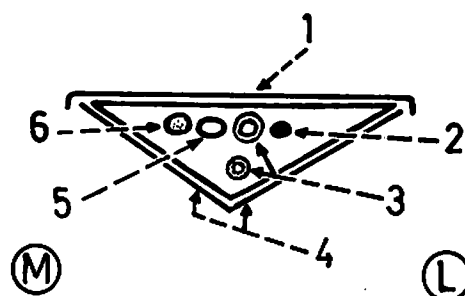


Fig.(99): STRUCTURES IN THE ROOF OF FEMORAL TRIANGLE

These are: great saphenous vein, 3 superficial inguinal vessels, superficial inguinal lymph nodes and cutaneous nerves.

1. inguinal ligament.
2. superficial inguinal lymph nodes.
3. femoral branch of genitofemoral nerve.
4. lateral border of the triangle.
5. ilioinguinal nerve.
6. superficial inguinal vessels.
7. great saphenous vein.
8. medial border of the triangle.

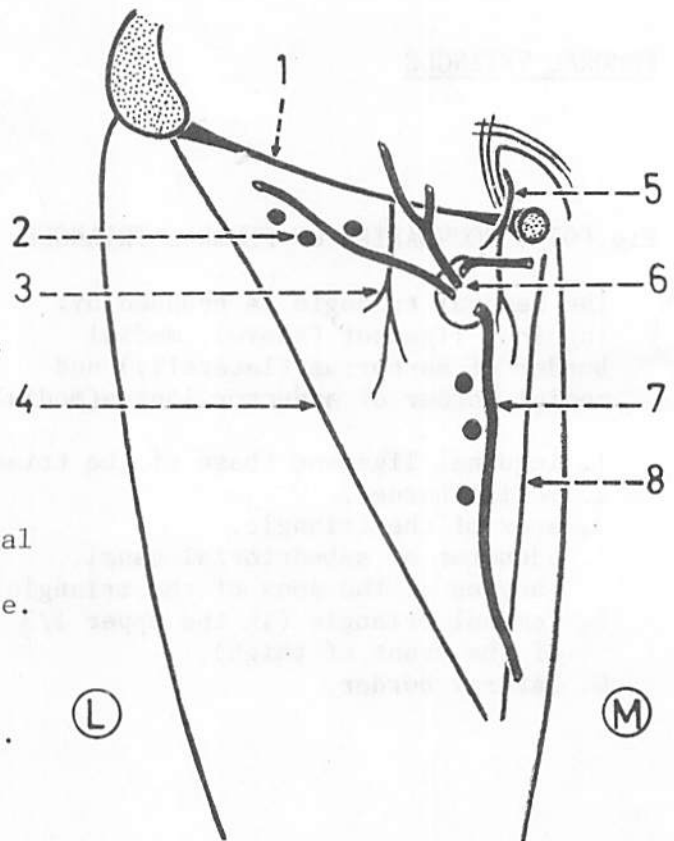
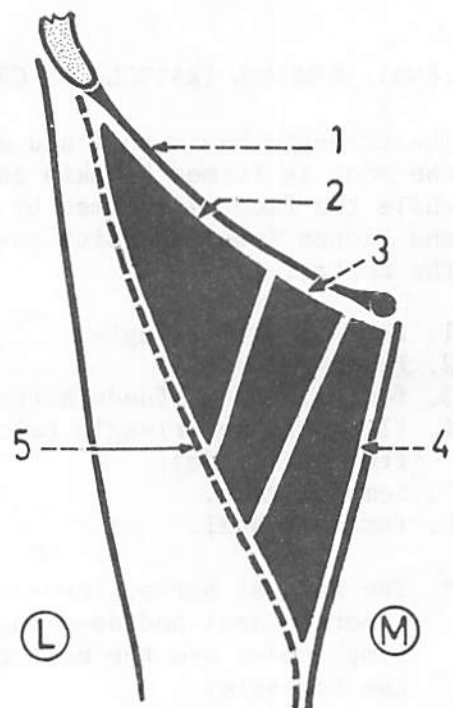


Fig.(100): FLOOR OF FEMORAL TRIANGLE

It is formed by 3 muscles: iliopsoas, pectineus and adductor longus (from lateral to medial).

1. inguinal ligament.
2. iliopsoas.
3. pectineus.
4. adductor longus.
5. lateral border of the triangle.



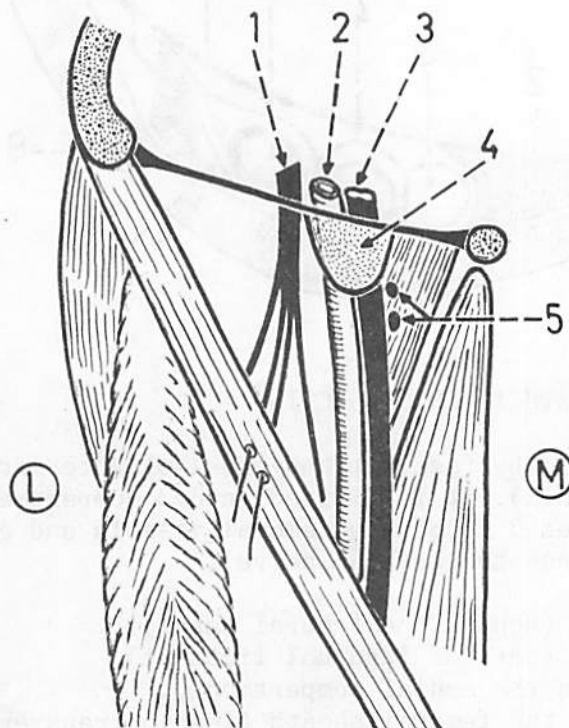


Fig.(101): CONTENTS OF FEMORAL TRIANGLE

The contents of the triangle lie between the roof and the floor of the triangle. These are nerves, vessels, lymph nodes and femoral sheath.

1. femoral nerve (lies outside the femoral sheath, lateral to the femoral vessels).
2. femoral artery (it gives off the profunda femoris, deep external pudental and superficial inguinal arteries while in the triangle).
3. femoral vein (runs along the medial side of femoral artery).
4. femoral sheath (it surrounds the upper 3 cm of the femoral vessels and encloses the femoral canal).
5. deep inguinal lymph nodes (about 3 nodes along the upper part of the femoral vein).

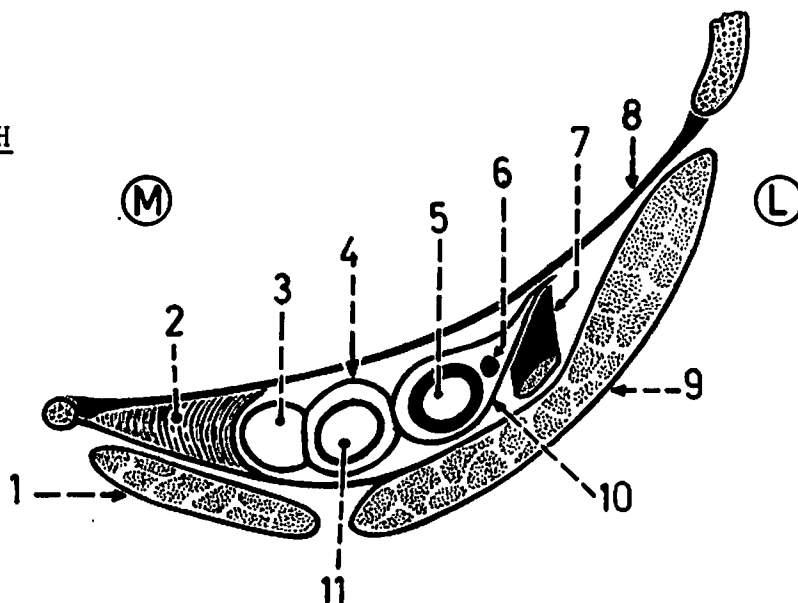
FEMORAL SHEATH

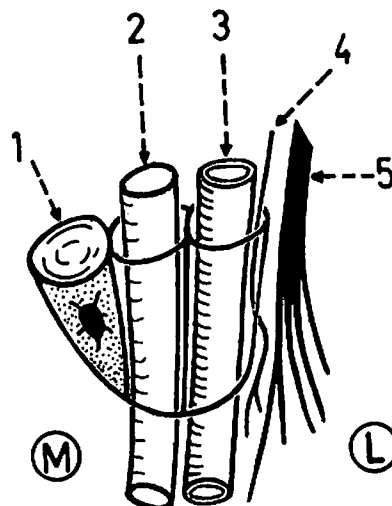
Fig.(102): FEMORAL SHEATH IN CROSS-SECTION

It is a sheath formed by fascia transversalis (anterior wall) and fascia iliaca (posterior wall). It is divided into 3 compartments by 2 septa. It envelops the upper 3 cm of the femoral vessels and encloses the femoral canal (but not the femoral nerve).

1. pectineus muscle (behind the femoral canal).
2. lacunar ligament (part of inguinal ligament).
3. femoral canal (in the medial compartment).
4. anterior wall of the femoral sheath (fascia transversalis).
5. femoral artery (in the lateral compartment).
6. femoral branch of genitofemoral nerve (in the lateral compartment).
7. femoral nerve (outside the femoral sheath).
8. inguinal ligament.
9. iliopsoas muscle.
10. posterior wall of the femoral sheath (fascia iliaca).
11. femoral vein (in the intermediate compartment).

✓ Fig.(103): FEMORAL SHEATH
(anterior view)

1. femoral canal (contains fat and one lymph node).
2. femoral vein (in the intermediate compartment).
3. femoral artery (in the lateral compartment).
4. femoral branch of genitofemoral nerve (in the lateral compartment).
5. femoral nerve (outside the sheath).



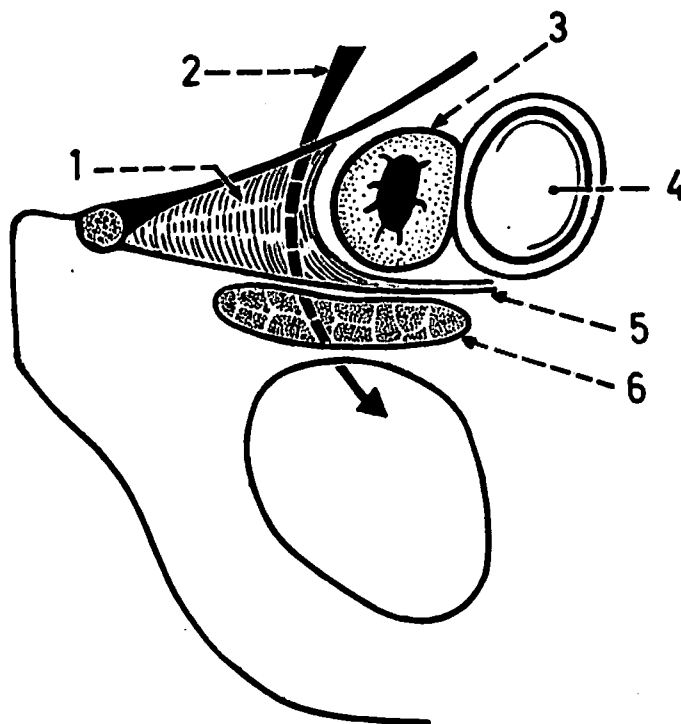
FEMORAL CANAL AND FEMORAL HERNIA

Fig.(104):FEMORAL CANAL

It is the most medial compartment of the femoral sheath through which the femoral hernia may pass. Its upper end is called femoral ring which is bounded by lacunar ligament medially and the femoral vein laterally. The femoral ring is closed by femoral septum.

1. lacunar ligament (triangular with a free sharp lateral border).
2. arrow indicating the site of abnormal obturator artery which may be present in 30% of subjects, behind the free margin of the lacunar ligament.
3. femoral canal (contains one lymph node and many lymphatics passing to the pelvis).
4. femoral vein (lateral to the canal).
5. pectineal ligament (lateral extension of the lacunar ligament along the pectineal line).
6. pectineus muscle (forms the bed for the femoral canal).

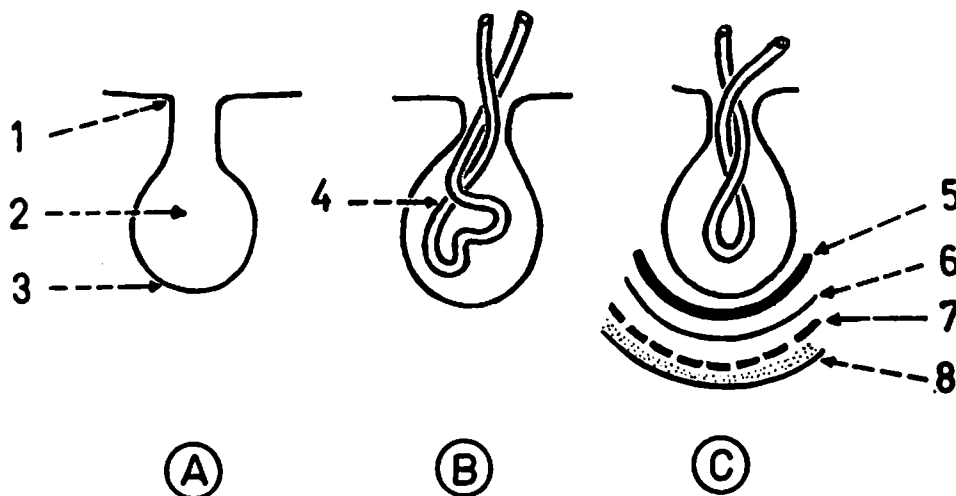


Fig.(105): ANATOMY OF HERNIA IN GENERAL

A hernia is defined as the protrusion of some abdominal contents (usually a loop of intestine) through a weak point in the abdominal wall (e.g. femoral canal or inguinal canal). The hernia starts by protrusion of a pouch of parietal peritoneum which forms the hernial sac. The sac has a neck and a fundus and its cavity may contain loops of intestine. As the hernial sac proceeds to the outside, it takes coverings over its fundus.

(A) Hernial sac:

1. neck of the sac.
2. cavity of the sac.
3. fundus of the sac.

(B) Contents of the sac:

4. loop of intestine (usually ileum) enters the sac.

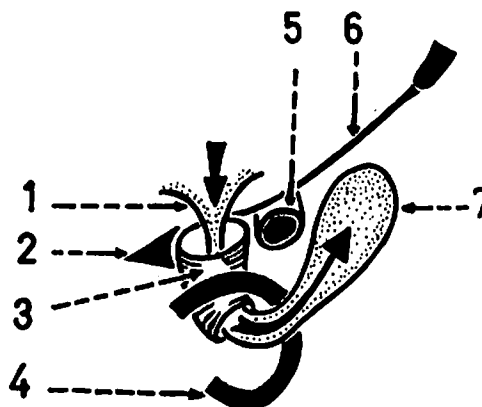
(C) Coverings of the sac:

- In case of femoral hernia these coverings are (from inside outwards):
5. femoral septum (extraperitoneal condensation filling the femoral ring).
 6. anterior wall of femoral canal.
 7. cribriform fascia.
 8. skin and superficial fascia.

Fig.(106): FEMORAL HERNIA

It is a protrusion of a peritoneal pouch through the femoral canal. It may proceed through the saphenous opening to appear under the skin just below the inguinal ligament.

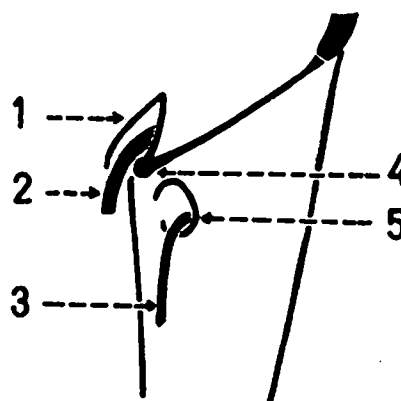
1. neck of the hernial sac.
2. lacunar ligament.
3. femoral canal.
4. saphenous opening.
5. femoral vein.
6. inguinal ligament.
7. fundus of the hernial sac.



- * The hernia courses at 1st downwards in the femoral canal, then forwards through the saphenous opening and finally upwards and laterally towards the anterior superior iliac spine; it has a U-shaped course.

Fig.(107): RELATION OF THE PUBIC TUBERCLE TO SAPHENOUS OPENING AND SUPERFICIAL INGUINAL RING

1. superficial inguinal ring (through which inguinal hernia passes).
2. spermatic cord.
3. great saphenous vein.
4. pubic tubercle (can be felt under the skin).
5. saphenous opening (through which femoral hernia passes).



- * A femoral hernia lies below and lateral to the pubic tubercle while an inguinal hernia lies above and medial.

FEMORAL NERVE

Fig.(108): COURSE OF FEMORAL NERVE

It arises from the lumbar plexus (L.2,3,4) and is seen in the abdomen at the lateral border of psoas major between it and the iliacus. It passes behind the inguinal ligament to enter the femoral triangle where it ends rapidly by giving off its branches.

1. iliacus.
2. psoas major.
3. inguinal ligament.
4. pectineus.
5. femoral nerve (ends 1 inch below the inguinal ligament).

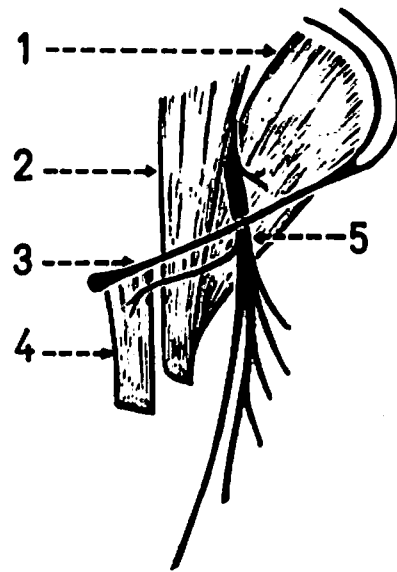
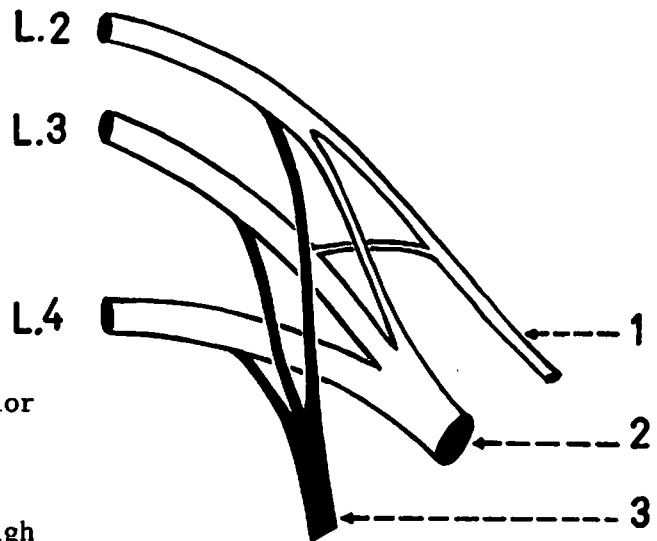


Fig.(109): ORIGIN OF FEMORAL NERVE FROM LUMBAR PLEXUS

It arises from the lumbar plexus from the 2nd, 3rd and 4th roots (posterior divisions). The anterior divisions of these roots give origin to the obturator nerve.

1. lateral cutaneous nerve of thigh (L.2,3).
2. femoral nerve (L. 2,3,4 posterior divisions).
3. obturator nerve (L.2,3,4, anterior divisions).



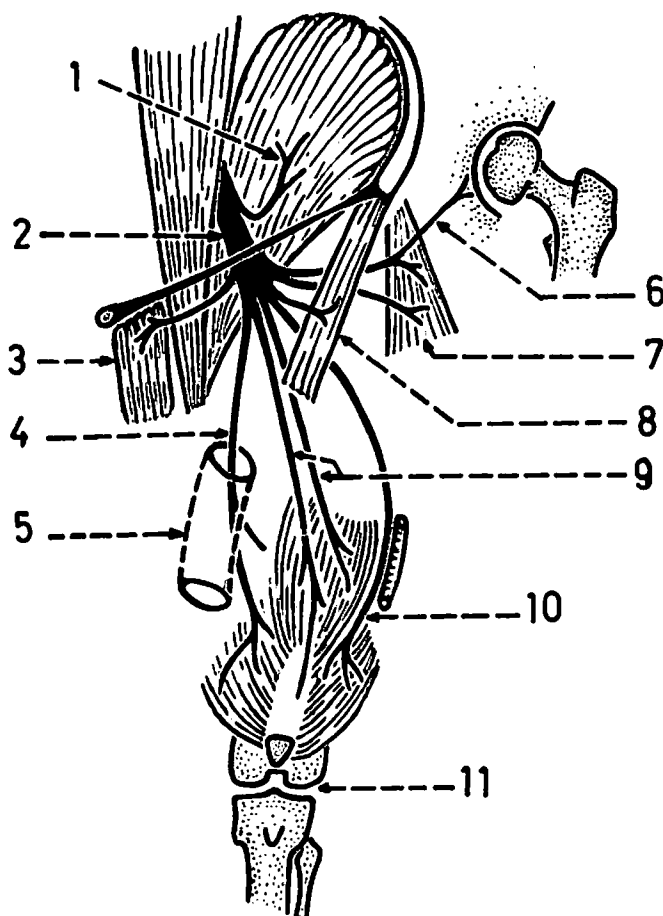


Fig.(110): MUSCULAR BRANCHES OF FEMORAL NERVE

The femoral nerve supplies the iliacus, pectineus, sartorius and the 4 heads of quadriceps femoris.

1. branch to iliacus (arises from the femoral nerve in the abdomen).
2. trunk of femoral nerve.
3. pectineus(its branch runs medially deep to the femoral sheath).
4. nerve to vastus medialis (enters the adductor canal).
5. adductor canal.
6. articular branch to the hip joint.
7. rectus femoris (its branches enter its upper part).
8. sartorius (its branches enter its upper part).
9. branches to vastus intermedius (enter the front of the muscle).
10. branch to vastus lateralis (accompanied by descending branch of lateral circumflex artery).
11. knee joint (gets articular branches from the nerves to the 3 vasti).

* The femoral nerve is the nerve of the anterior compartment of the thigh.

Fig.(111): CUTANEOUS BRANCHES OF FEMORAL NERVE

It gives off 3 branches: saphenous nerve, intermediate cutaneous nerve of thigh and medial cutaneous nerve of thigh. The saphenous nerve is the longest and reaches down to the foot while the others do not extend below the knee.

1. trunk of femoral nerve.
2. medial cutaneous nerve of thigh.
3. saphenous nerve (runs in the adductor canal).
4. intermediate cutaneous nerve of thigh.
5. infrapatellar branch of saphenous nerve (joins a plexus in front of the patella).

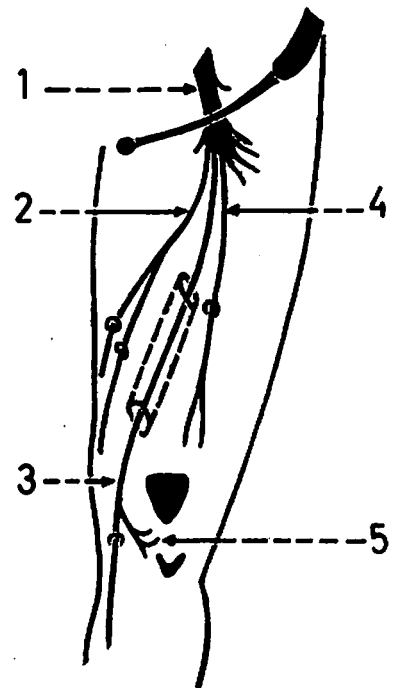
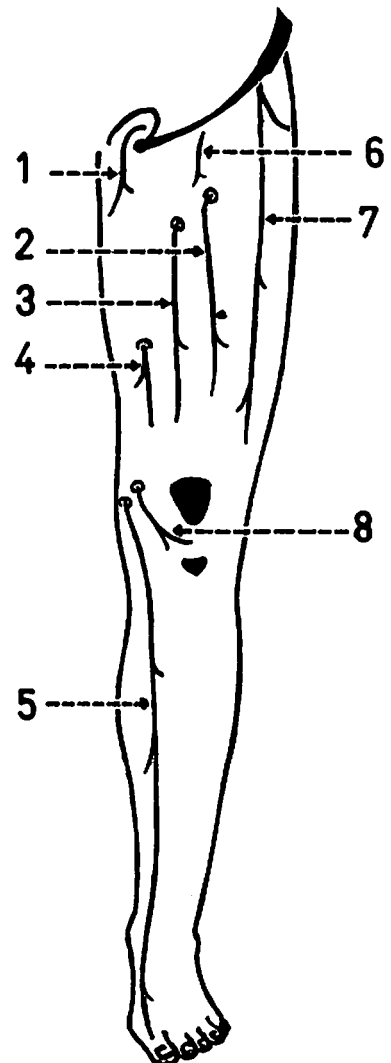


Fig.(112): CUTANEOUS NERVES OF THE FRONT OF THIGH

These nerves are derived from the femoral nerve as well as directly from the lumbar plexus.

1. ilio-inguinal nerve.
2. intermediate cutaneous nerve of thigh.
3. medial cutaneous nerve of thigh.
4. cutaneous branch of obturator nerve.
5. saphenous nerve (it is deeply placed in the thigh but becomes subcutaneous only in the leg and foot).
6. femoral branch of genito-femoral nerve.
7. lateral cutaneous nerve of thigh.
8. infrapatellar branch of saphenous nerve.



FEMORAL VESSELS

Fig.(113): COURSE OF FEMORAL ARTERY

It begins at the mid-inguinal point and ends at the opening in the adductor magnus. The upper 1/2 of its course is in the femoral triangle while the lower 1/2 is in the adductor canal.

1. femoral artery in the femoral sheath (upper 3 cm).
2. femoral artery in the femoral triangle.
3. femoral artery in the adductor canal.
4. end of femoral artery (becomes the popliteal artery).
5. popliteal artery.

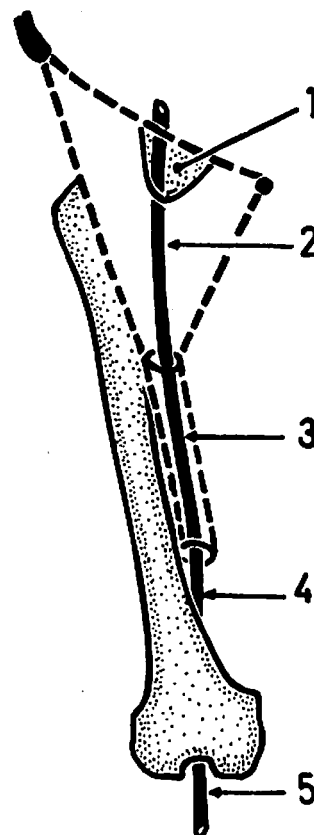
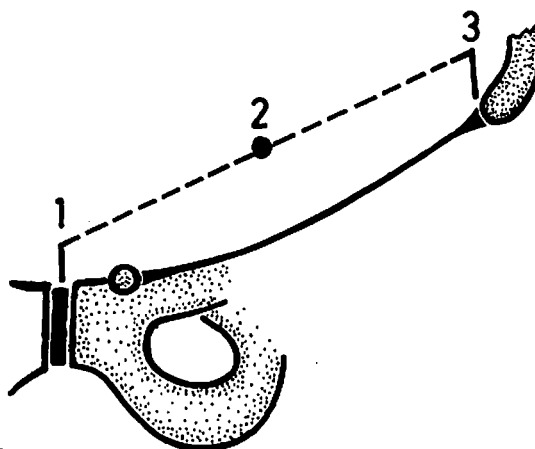


Fig.(114): MID-INGUINAL POINT

It is a point situated midway between the anterior superior iliac spine and symphysis pubis.

1. symphysis pubis.
2. mid-inguinal point.
3. anterior superior iliac spine.

* The mid-inguinal point differs from the midpoint of the inguinal ligament which lies midway between the anterior superior iliac spine and the pubic tubercle.



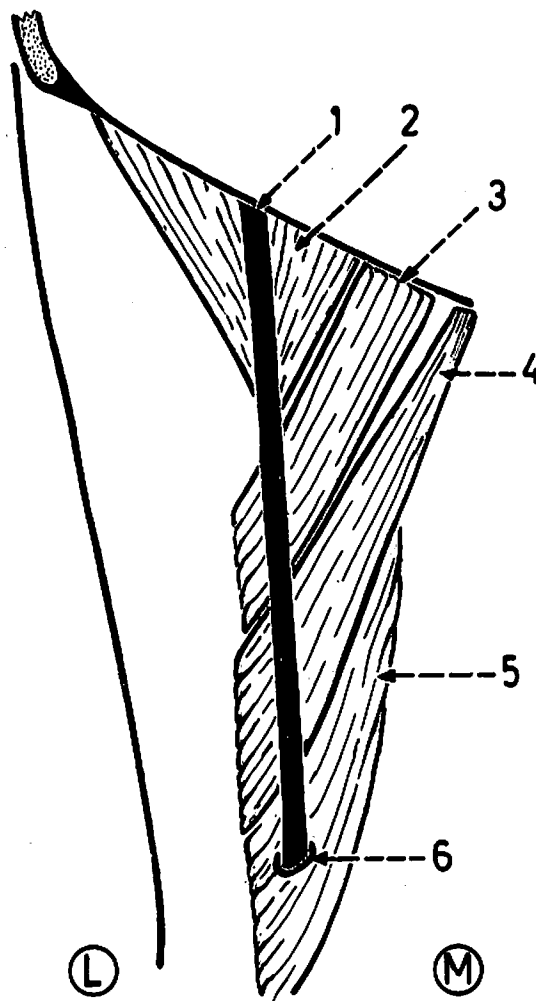


Fig.(115): MUSCLES POSTERIOR TO FEMORAL ARTERY

The artery is related posteriorly to iliopsoas, pectineus, adductor longus and adductor magnus (from above downwards).

1. femoral artery.
2. iliopsoas.
3. pectineus.
4. adductor longus.
5. adductor magnus.
6. opening in adductor magnus.

* The femoral vein accompanies the femoral artery throughout its course.

Fig.(116): RELATION OF FEMORAL ARTERY
TO ILIOPSOAS

The iliopsoas separates the artery from 2 bony structures: head of femur (movable) and superior ramus of pubis (fixed); the artery can be compressed against the latter point.

1. iliopsoas.
2. femoral artery.

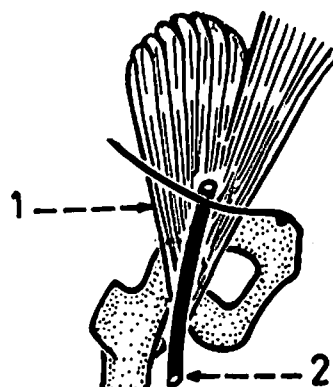


Fig.(117): RELATION OF FEMORAL ARTERY
TO PECTINEUS

The femoral artery is separated from the pectineus by the profunda femoris artery.

1. profunda femoris artery.
2. pectineus.

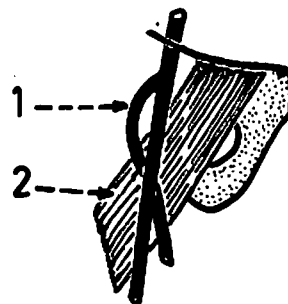


Fig.(118): RELATION OF FEMORAL ARTERY
TO ADDUCTOR LONGUS

The insertion of the adductor longus separates the femoral vessels from the profunda vessels. This takes place at the middle of the medial side of thigh.

1. femoral artery.
2. adductor longus.
3. femoral vein.
4. profunda vessels (behind the adductor longus).

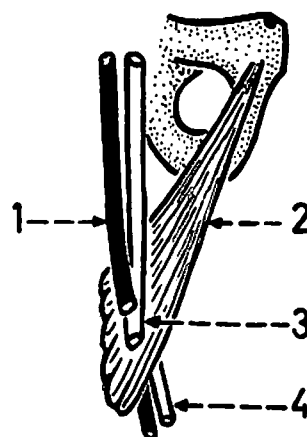


Fig.(119): RELATION OF FEMORAL ARTERY
TO FEMORAL VEIN

The femoral vein is medial to the artery at the inguinal ligament but comes posterior to it at the apex of femoral triangle. In the adductor canal the vein gradually becomes posterolateral.

1. femoral canal.
2. femoral vein.
3. apex of femoral triangle and beginning of adductor canal.
4. femoral artery.

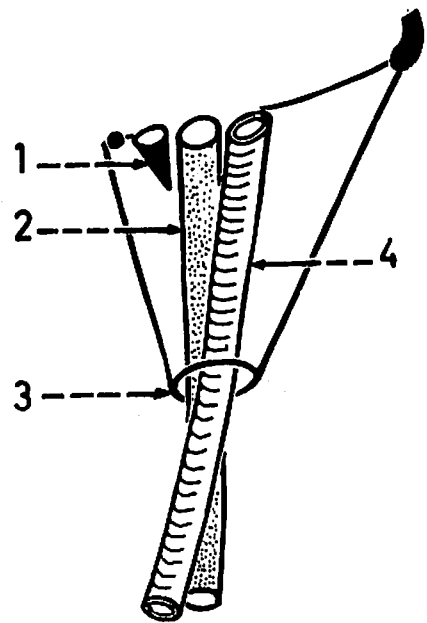
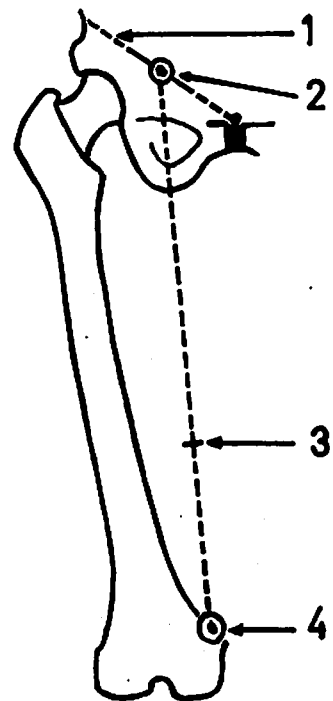


Fig.(120): SURFACE ANATOMY OF FEMORAL ARTERY

It corresponds to the upper 2/3 of a line drawn from the midinguinal point to the adductor tubercle.

1. inguinal ligament.
2. midinguinal point.
3. end of femoral artery.
4. adductor tubercle (can be felt under the skin).



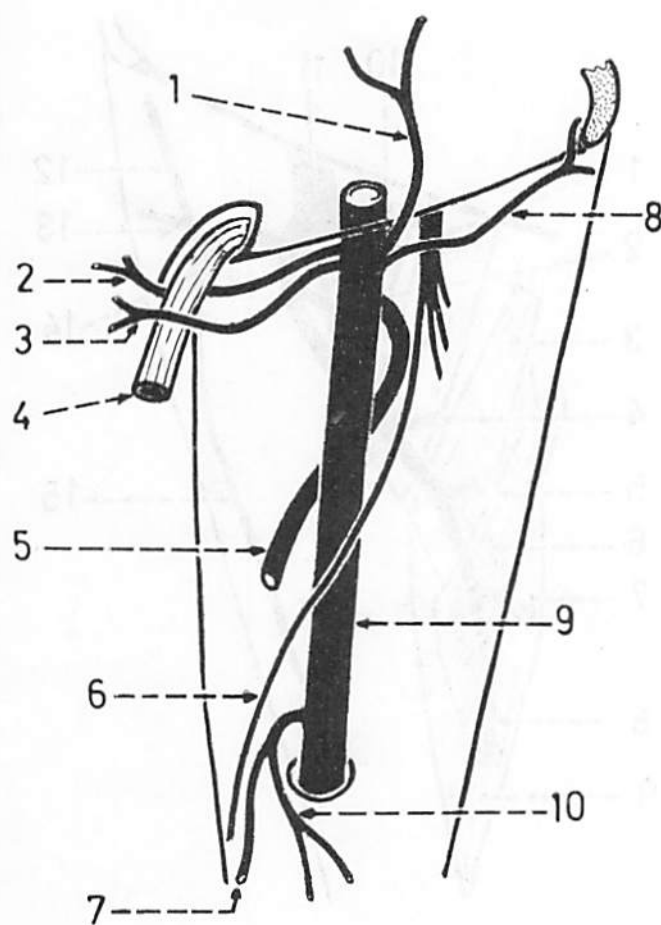


Fig.(121): BRANCHES OF FEMORAL ARTERY

The femoral artery gives off 3 superficial inguinal branches (superficial circumflex iliac, superficial epigastric, superficial external pudendal) and 3 deep branches (profunda femoris, deep external pudendal, descending genicular).

1. superficial epigastric artery (runs upwards to the lower part of anterior abdominal wall).
2. deep external pudendal artery (runs medially deep to spermatic cord to reach the external genital organs).
3. superficial external pudendal artery (runs medially superficial to the spermatic cord to reach the external genital organs).
4. spermatic cord (comes out through the superficial inguinal ring).
5. profunda femoris artery (arises 4 cm below the inguinal ligament and runs deeply among the muscles of thigh).
6. saphenous nerve (crosses the femoral artery from lateral to medial).
7. saphenous artery (arises from the descending genicular and accompanies the saphenous nerve).
8. superficial circumflex iliac artery (runs laterally to the anterior superior iliac spine, just below the inguinal ligament).
9. femoral artery.
10. descending genicular artery (the lowermost, descends to the knee joint).

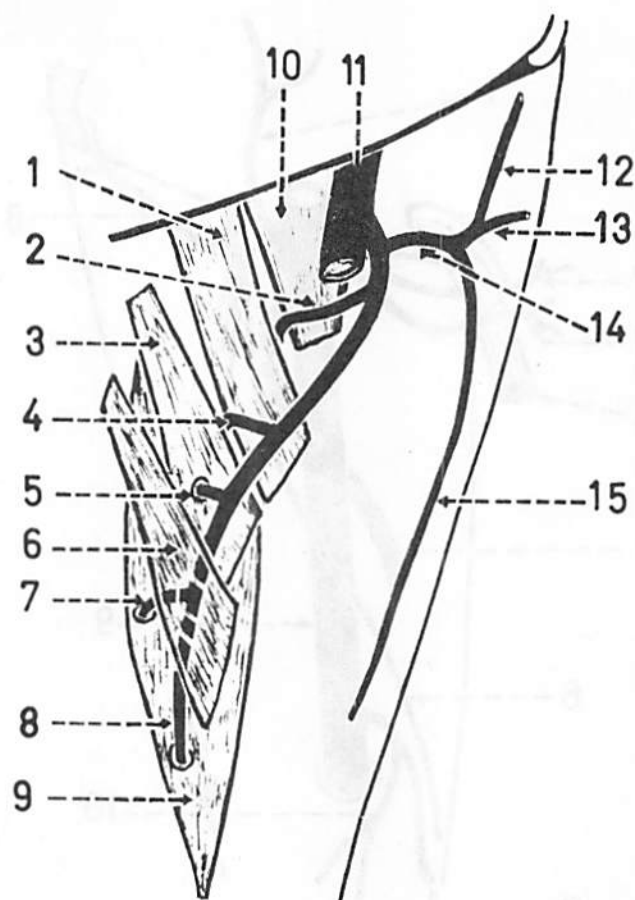


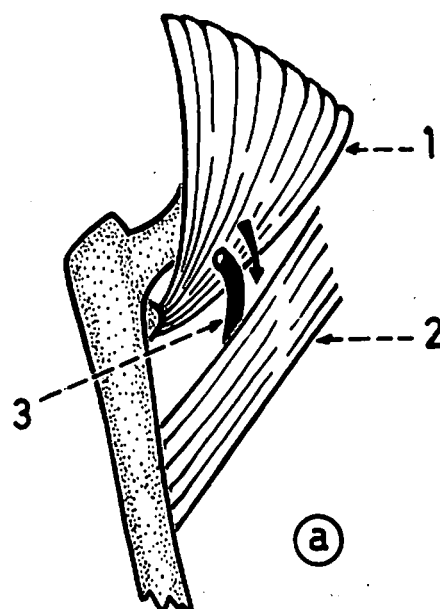
Fig.(122): PROFUNDA FEMORIS ARTERY

It arises from the femoral artery 4 cm below the inguinal ligament, and curves medially behind the femoral artery. It descends among the muscles of the medial side of thigh and ends by becoming the 4th perforating artery. It gives off 2 circumflex branches (lateral and medial) and 4 perforating branches.

1. pectineus (deep to the profunda artery).
2. medial circumflex femoral artery (runs medially then backwards between psoas major and pectineus).
3. adductor brevis (deep to the profunda artery).
4. 1st perforating artery (arises above the adductor brevis).
5. 2nd perforating artery (pierces the adductor brevis).
6. adductor longus (in front of the profunda artery).
7. 3rd perforating artery (arises below the adductor brevis).
8. 4th perforating artery (termination of the profunda artery).
9. adductor magnus (pierced by the 4 perforating arteries).
10. iliopsoas muscle.
11. femoral artery.
12. ascending branch of lateral circumflex femoral artery.
13. transverse branch of lateral circumflex femoral artery.
14. lateral circumflex femoral artery (runs laterally among the branches of femoral nerve deep to sartorius and rectus femoris).
15. descending branch of lateral circumflex femoral artery.

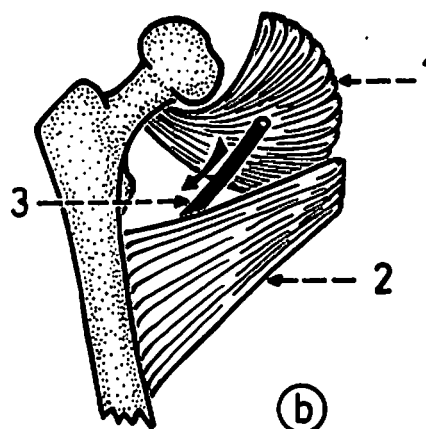
Fig.(123): COURSE OF MEDIAL CIRCUMFLEX FEMORAL ARTERY

It arises from the profunda femoris and runs medially then backwards between the iliopsoas and pectineus, then between the obturator externus and adductor brevis to appear on the back of thigh between the quadratus femoris and adductor magnus.



(a) The artery between iliopsoas and pectineus:

1. iliopsoas.
2. pectineus.
3. medial circumflex femoral artery.



(b) The artery between obturator externus and adductor brevis:

1. obturator externus.
2. adductor brevis.
3. medial circumflex femoral artery.

(c) The artery in the back of thigh between quadratus femoris and adductor magnus:

1. quadratus femoris.
2. adductor magnus.
3. greater trochanter.
4. medial circumflex femoral artery.

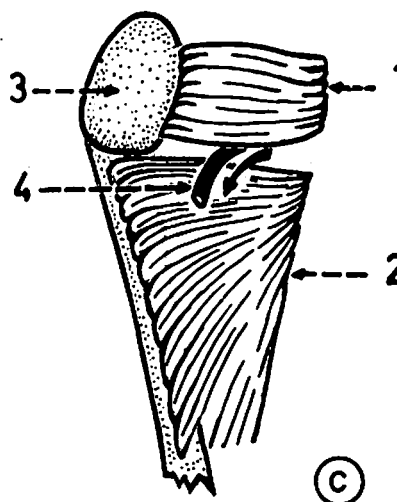


Fig.(124): ANASTOMOSIS AROUND ANTERIOR
SUPERIOR ILIAC SPINE

It is between branches from the external iliac, internal iliac and femoral arteries.

1. external iliac artery.
2. deep circumflex iliac artery (from external iliac).
3. anterior superior iliac spine.
4. superior gluteal artery (from internal iliac).
5. superficial circumflex iliac (from femoral).
6. ascending branch of lateral circumflex femoral (from profunda femoris branch of femoral).
7. inguinal ligament.

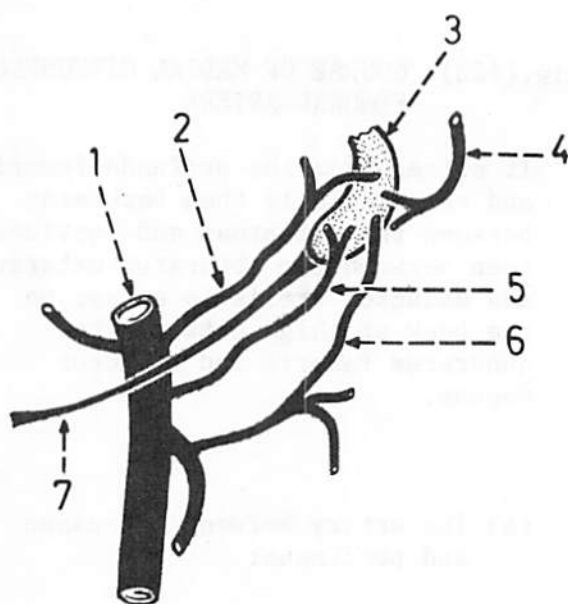


Fig.(125): ANASTOMOSIS IN EXTERNAL
GENITAL ORGANS

It is between branches from the internal iliac and femoral arteries.

1. external genital organs (pudendum).
2. scrotal branches of internal pudendal (from internal iliac).
3. deep external pudendal (from femoral).
4. femoral artery.
5. superficial external pudendal (from femoral).

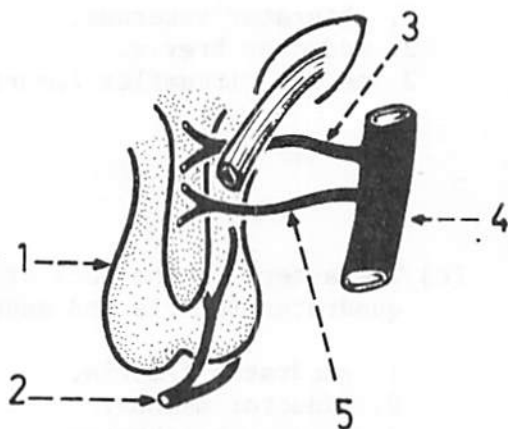


Fig.(126): CRUCIATE ANASTOMOSIS

This anastomosis is placed on the back of thigh a short distance below the greater trochanter and looks like a cross (+). It has 2 limbs: horizontal and vertical. The horizontal limb is formed by the transverse branches of the medial and lateral circumflex femoral, while the vertical limb is formed by the inferior gluteal, ascending branch of medial circumflex and ascending branch of 1st perforating artery.

1. inferior gluteal artery (from internal iliac).
2. ascending branch of medial circumflex femoral artery (from profunda femoris).
3. transverse branch of lateral circumflex femoral artery. (from profunda femoris).
4. longitudinal chain of anastomosis (between the 4 perforating arteries of profunda femoris).
5. a branch from the popliteal artery which joins the 4th perforating.
6. medial circumflex femoral artery.
7. 1st perforating artery.
8. popliteal artery.

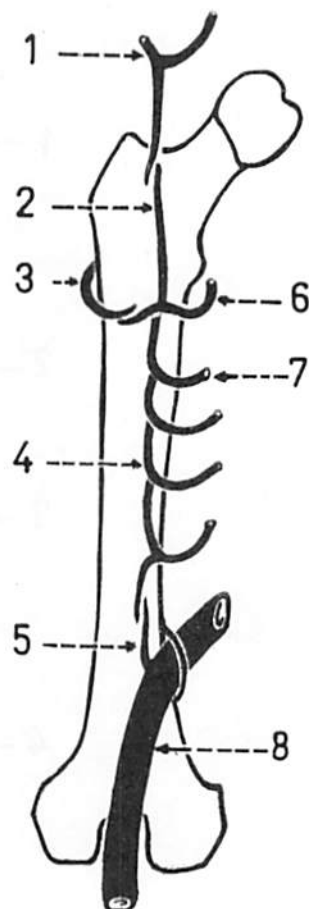
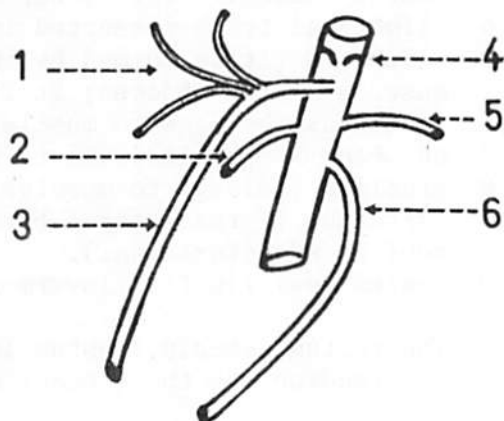


Fig.(127): TRIBUTARIES OF FEMORAL VEIN

These are the great saphenous vein, profunda femoris vein, medial circumflex and lateral circumflex femoral veins.

1. superficial inguinal veins (end in great saphenous vein).
2. medial circumflex femoral vein.
3. great saphenous vein.
4. femoral vein showing a valve.
5. lateral circumflex femoral vein.
6. profunda femoris vein.



* The medial and lateral circumflex femoral veins end directly in the femoral vein and not in the profunda vein.

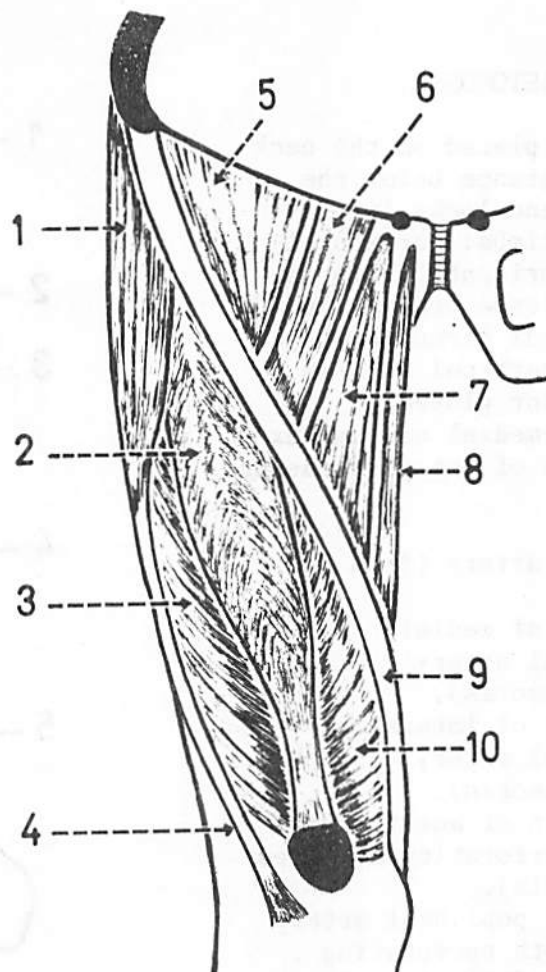
MUSCLES

Fig.(128): MUSCLES OF THE FRONT OF THIGH

These are the sartorius, quadriceps femoris, articularis genu and tensor fasciae latae. All these muscles are supplied by the femoral nerve except the tensor fasciae latae which is supplied by the superior gluteal nerve.

1. tensor fasciae latae.
2. rectus femoris (its origin is hidden by the upper part of sartorius).
3. vastus lateralis (its lowermost fibres are oblique).
4. iliotibial tract (inserted into the lateral condyle of tibia).
5. iliopsoas (it is formed by the iliacus and psoas major which are muscles of the abdomen; it lies in the floor of the femoral triangle).
6. pectineus (belongs to muscles of the medial side of thigh).
7. adductor longus (belongs to muscles of the medial side of thigh).
8. gracilis (belongs to muscles of the medial side of thigh).
9. sartorius (forms lateral border of femoral triangle and lies on the roof of adductor canal).
10. vastus medialis (its lowermost fibres are horizontal).

* The rectus femoris, vastus lateralis, vastus medialis and vastus intermedius are the 4 heads of quadriceps femoris.

* The vastus intermedius lies under cover of rectus femoris.

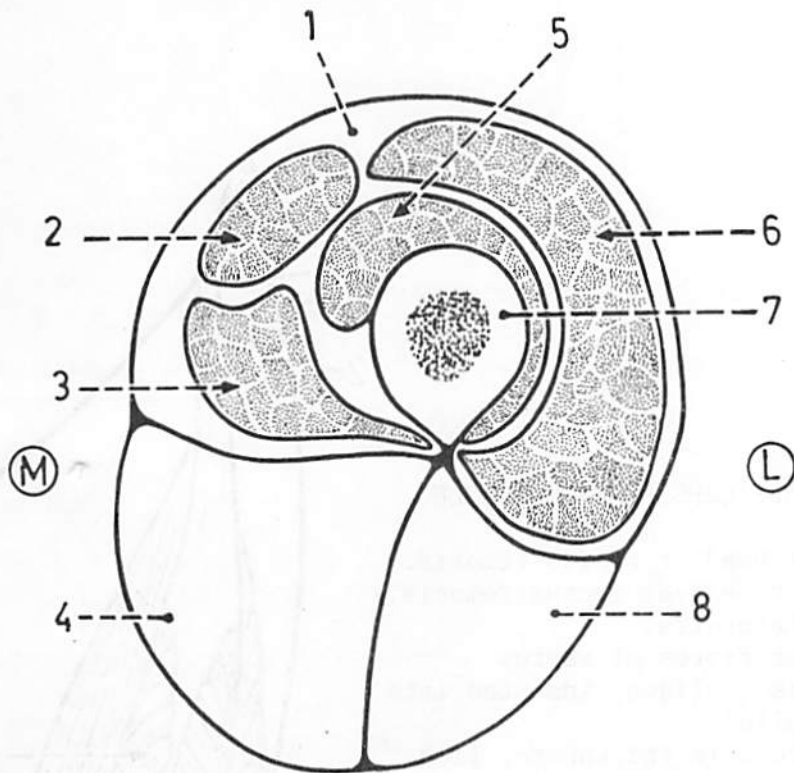


Fig.(129): QUADRICEPS FEMORIS IN CROSS-SECTION

The 4 heads of quadriceps femoris fill the anterior compartment of the thigh.

1. anterior compartment of thigh.
2. rectus femoris (lies over the vastus intermedius).
3. vastus medialis (not attached to the medial surface of femur).
4. medial compartment of thigh.
5. vastus intermedius (covers the anterior and lateral surfaces of femur).
6. vastus lateralis (forms the fleshy mass on lateral side of thigh).
7. T.S. in the shaft of femur.
8. posterior compartment of thigh.

Fig.(130): ORIGIN OF RECTUS FEMORIS

It arises by a straight head and a reflected head.

1. anterior inferior iliac spine.
2. straight head (from anterior inferior iliac spine).
3. rectus femoris.
4. reflected head (from the groove just above the acetabulum).

* The rectus femoris is the only head of quadriceps which acts on hip joint.

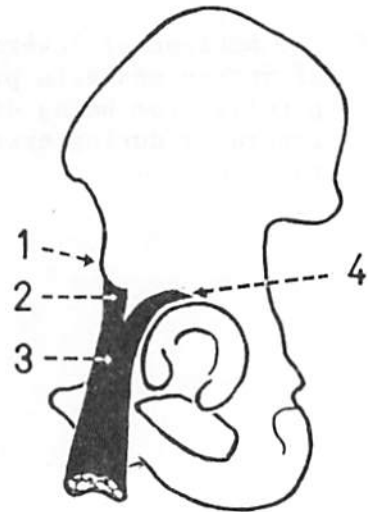


Fig.(131): QUADRICEPS FEMORIS MUSCLE

1. straight head of rectus femoris.
2. reflected head of rectus femoris.
3. vastus lateralis.
4. lowermost fibres of vastus lateralis (oblique, inserted into the patella).
5. rectus femoris (bipennate, lies over vastus intermedius).
6. vastus medialis.
7. lowermost fibres of vastus medialis (horizontal, inserted into the patella).
8. patella (receives insertion of quadriceps femoris).
9. ligamentum patellae.
10. tuberosity of tibia .

* The quadriceps femoris is the main extensor of the knee and the rectus femoris also assists in flexion of the hip joint.

* The horizontal lowermost fibres of vastus medialis prevent the patella from being displaced laterally during extension of the knee.

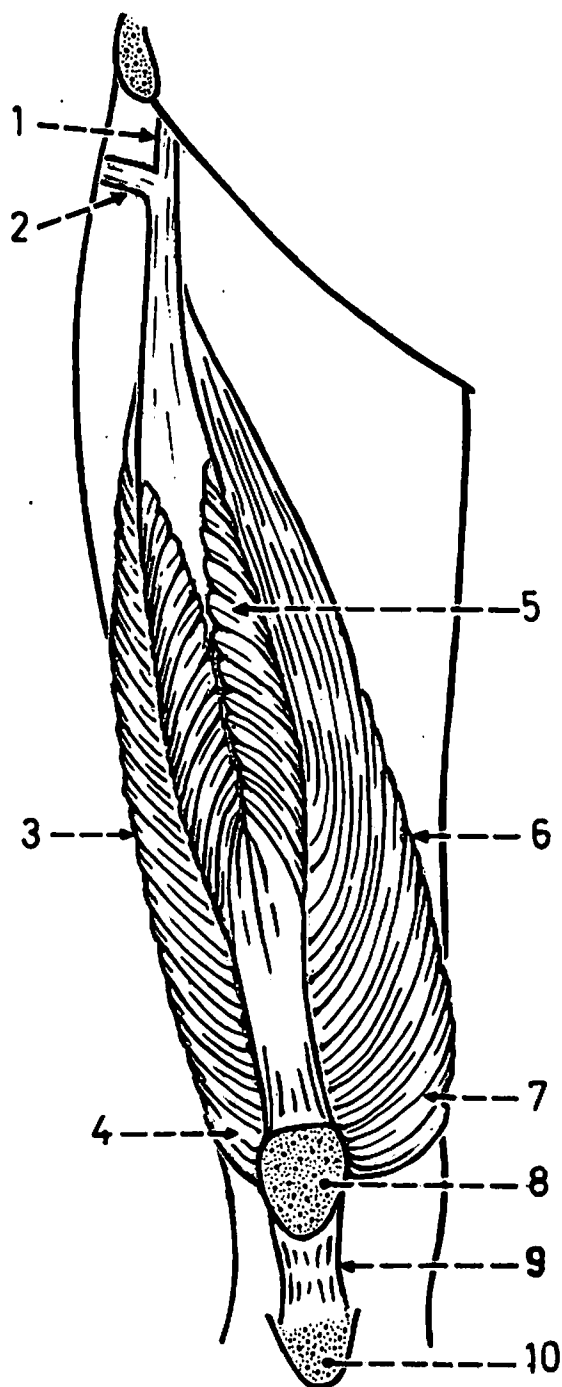
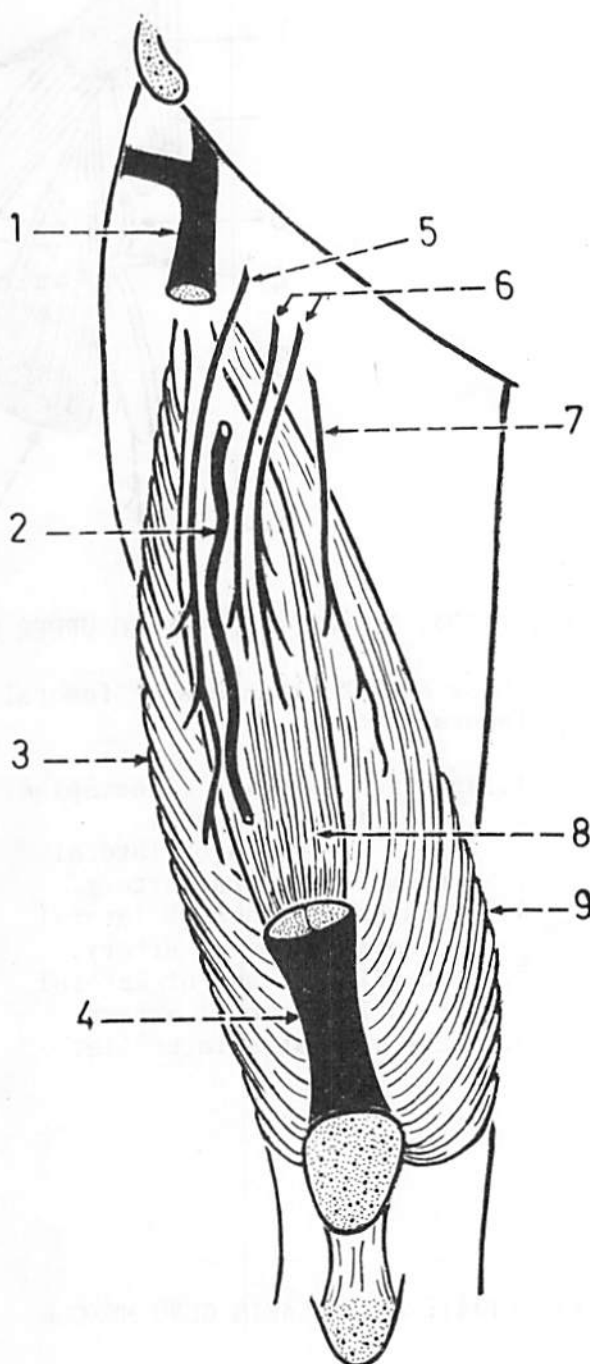


Fig.(132): THE 3 VASTI
(rectus femoris removed)

1. origin of rectus femoris (cut).
2. descending branch of lateral circumflex femoral artery (accompanies the nerve to vastus lateralis).
3. vastus lateralis.
4. rectus femoris (cut to expose vastus intermedius).
5. nerve to vastus lateralis (runs along the anterior border of vastus lateralis).
6. nerves to vastus intermedius (2 branches which enter the anterior surface of the muscle).
7. nerve to vastus medialis (enters the upper part of the adductor canal).
8. vastus intermedius.
9. vastus medialis.



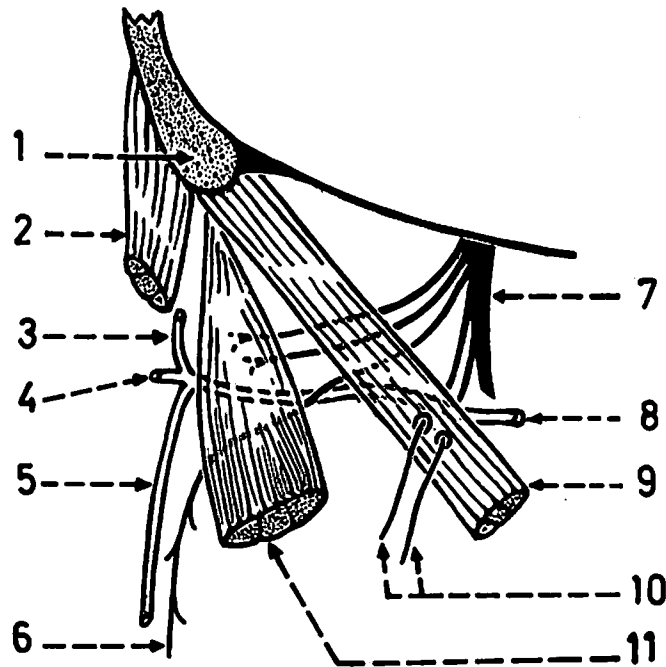


Fig.(133): STRUCTURES DEEP TO UPPER PART OF SARTORIUS AND RECTUS FEMORIS

These are the branches of femoral nerve and lateral circumflex femoral artery.

- | | |
|--|--|
| 1. anterior superior iliac spine. | 7. femoral nerve. |
| 2. tensor fasciae latae. | 8. lateral circumflex femoral artery. |
| 3. ascending branch of lateral circumflex femoral artery. | 9. sartorius. |
| 4. transverse branch of lateral circumflex femoral artery. | 10. intermediate cutaneous nerve of thigh (pierces the sartorius). |
| 5. descending branch of lateral circumflex femoral artery. | 11. rectus femoris (its tendon of origin lies between sartorius and tensor fasciae latae). |
| 6. nerve to vastus lateralis. | |

Fig.(134): ARTICULARIS GENU MUSCLE

It is some of the deepest fibres of the vastus intermedius which are inserted into the upper part of the synovial membrane of the knee.

- | |
|--|
| 1. articularis genu muscle. |
| 2. lower part of quadriceps femoris. |
| 3. synovial membrane of suprapatellar bursa (this bursa is an upward extension of knee joint). |
| 4. cavity of knee joint. |

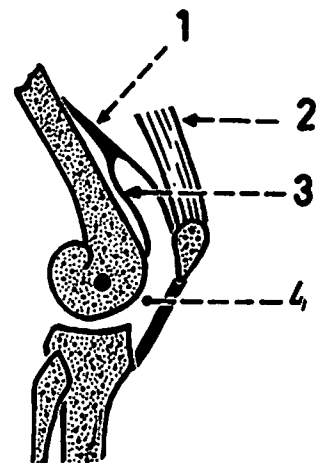


Fig.(135): INSERTION OF SARTORIUS

It is inserted into the upper part of the medial surface of tibia in front of the insertions of gracilis and semitendinosus (S.G.S.).

1. iliotibial tract.
2. ligamentum patellae (common insertion of quadriceps femoris).
3. patella.
4. insertion of sartorius.
5. insertion of gracilis.
6. insertion of semitendinosus.

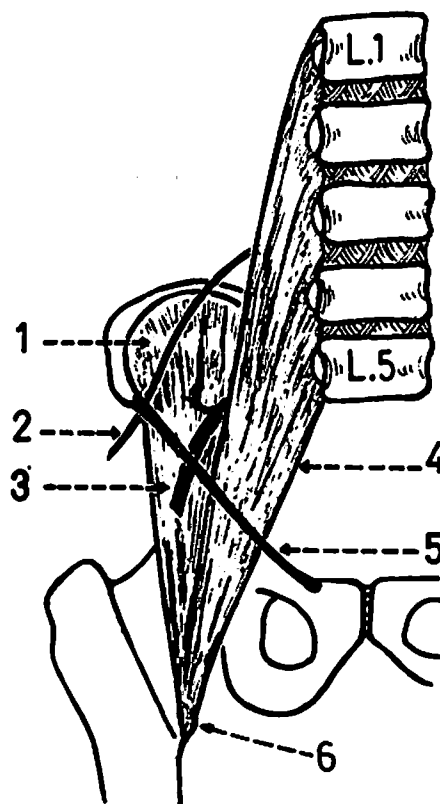


Fig.(136): ILIOPSOAS MUSCLE

It is formed of both psoas major and iliacus which arise in the abdomen and pass behind the inguinal ligament to be inserted into the lesser trochanter.

1. iliacus muscle (from iliac fossa).
2. lateral cutaneous nerve of thigh (just medial to anterior superior iliac spine).
3. femoral nerve (appears between iliacus and psoas major).
4. psoas major (from sides of the 5 lumbar vertebrae).
5. inguinal ligament.
6. lesser trochanter of femur.

* The iliopsoas lies directly in front of the hip joint from which it is separated by a bursa.



ADDUCTOR CANAL

It lies in the middle 1/3 of medial side of thigh, extending from the femoral triangle to the opening in the adductor magnus.

Fig.(137): CONTENTS OF ADDUCTOR CANAL

1. femoral artery.
2. femoral vein (posterolateral to the artery).
3. adductor canal.
4. saphenous nerve (crosses superficial to the artery from lateral to medial).
5. nerve to vastus medialis (in the upper part of the canal).

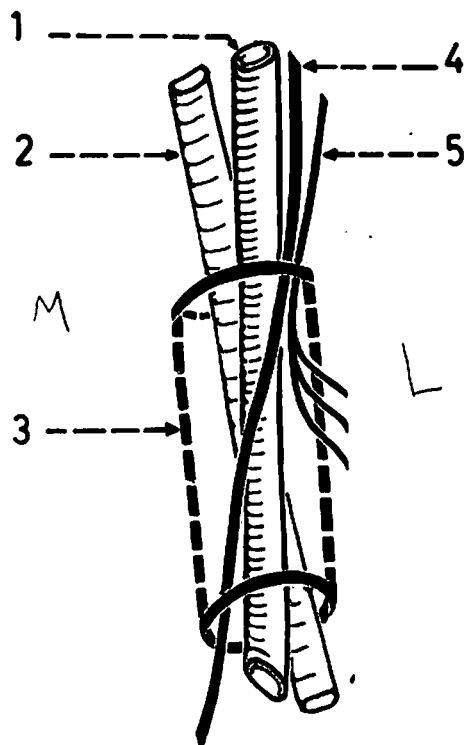


Fig.(138): WALLS OF ADDUCTOR CANAL (T.S.)

It is bounded by vastus medialis (anterolaterally) and adductor longus and magnus (posteriorly). Its roof is formed by strong deep fascia over which the sartorius lies.

1. fascial roof.
2. sartorius (lies over the roof).
3. vastus medialis (anterolateral).
4. adductor longus (posterior).
5. adductor magnus (posterior).
6. adductor canal (in section).

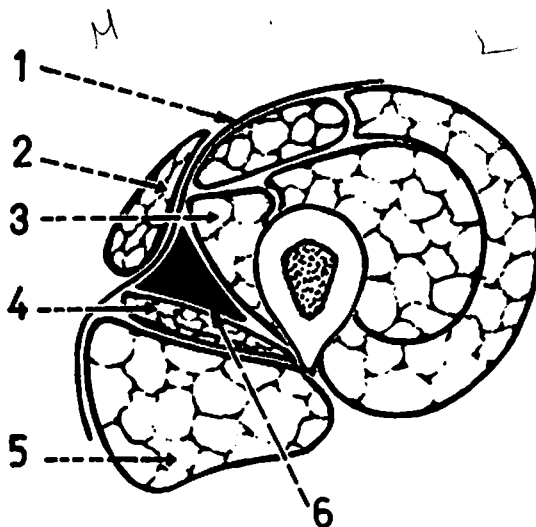
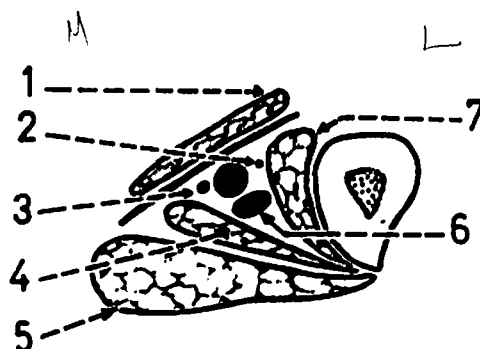


Fig.(139): CONTENTS OF ADDUCTOR CANAL (T.S.)

The canal contains 2 vessels (femoral artery and vein) and 2 nerves (saphenous nerve and nerve to vastus medialis).

1. sartorius.
2. nerve to vastus medialis.
3. saphenous nerve.
4. adductor longus.
5. adductor magnus.
6. femoral vessels.
7. vastus medialis.



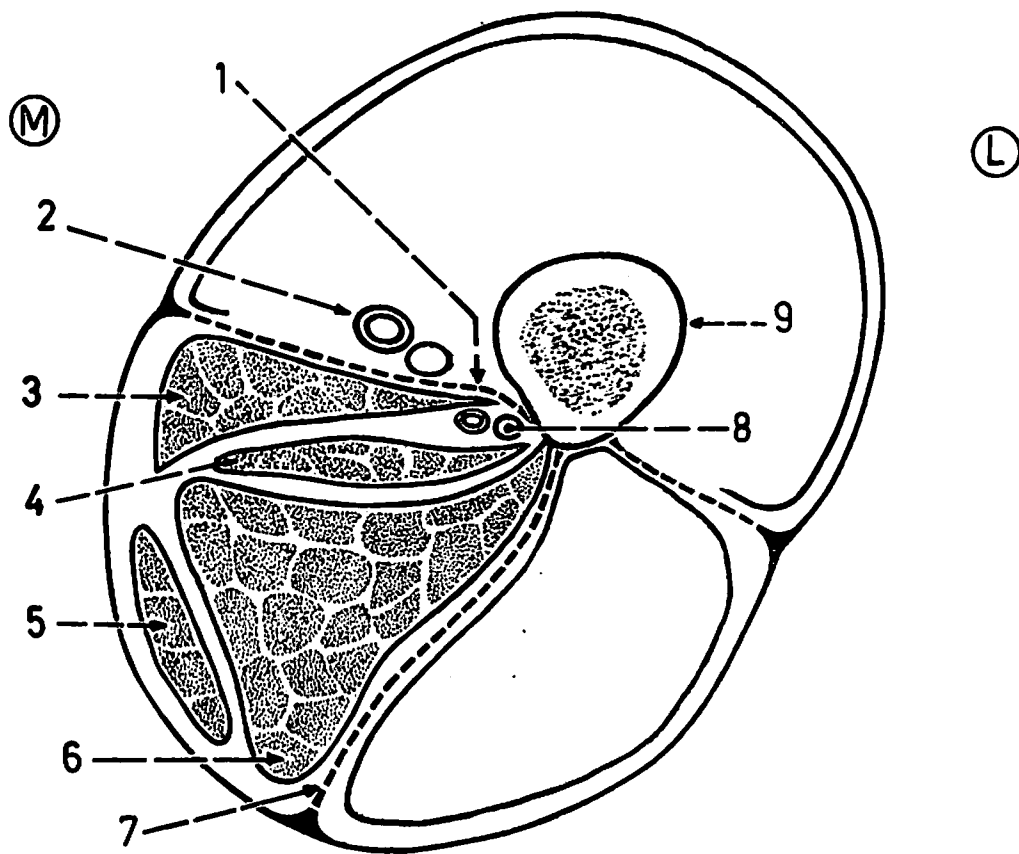
MEDIAL SIDE OF THIGH

Fig.(140): MEDIAL COMPARTMENT OF THIGH IN CROSS-SECTION

The medial compartment of the thigh is bounded by the medial and posterior intermuscular septa. It contains the adductor group of muscles as well as the profunda vessels and the obturator nerve.

1. medial intermuscular septum.
2. femoral vessels (in the anterior compartment).
3. adductor longus (the most anterior of the 3 adductors).
4. adductor brevis (behind the adductor longus).
5. gracilis (the most medial muscle).
6. adductor magnus (the biggest and most posterior).
7. posterior intermuscular septum.
8. profunda vessels (in the medial compartment deep to the insertion of the adductor longus which separates them from the femoral vessels).
9. femur (T.S.).

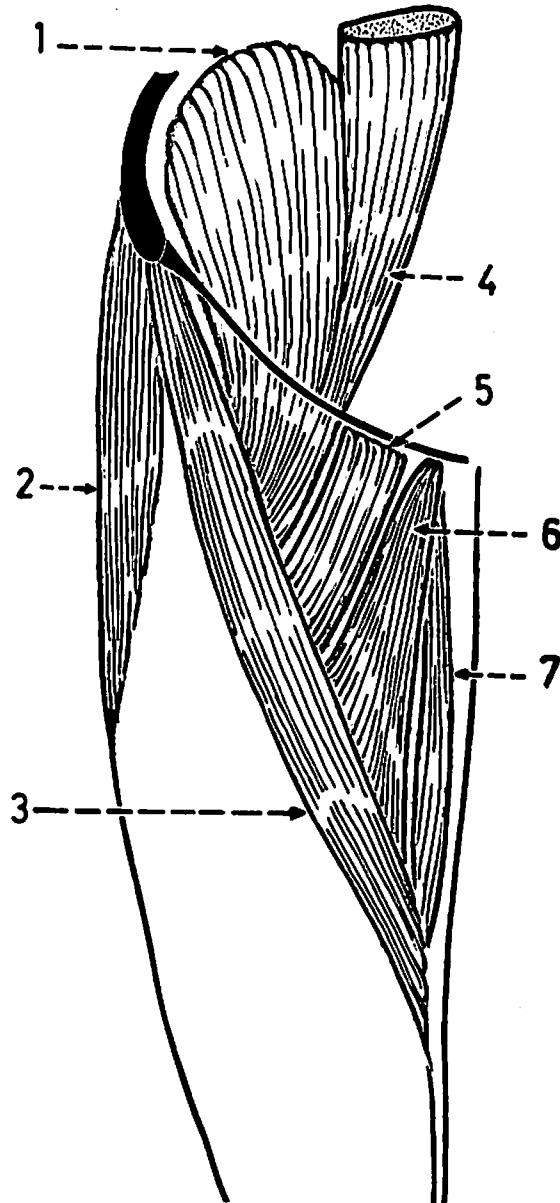


Fig.(141): MUSCLES OF MEDIAL SIDE OF THIGH
(superficial layer)

The superficial layer of muscles of medial side of thigh are: pectineus, adductor longus and gracilis.

- | | |
|--------------------------|---------------------|
| 1. iliacus. | 5. pectineus. |
| 2. tensor fasciae latae. | 6. adductor longus. |
| 3. sartorius. | 7. gracilis. |
| 4. psoas major. | |

* The 3 superficial muscles (pectineus, adductor longus, gracilis) lie over 3 other deep muscles (adductor brevis, adductor magnus, obturator externus).

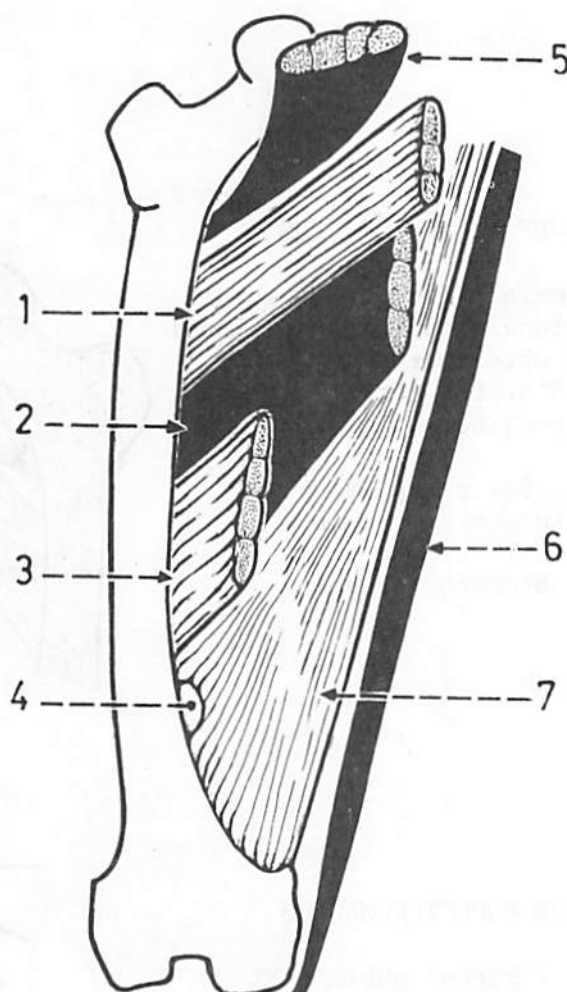


Fig.(142): ARRANGEMENT OF ADDUCTOR MUSCLES

The adductor muscles are arranged as follows (from superficial to deep): adductor longus (most superficial), adductor brevis (deep to adductor longus) and adductor magnus (the deepest).

1. pectineus (its insertion extends between the insertion of iliopsoas and that of adductor longus).
2. adductor brevis (its insertion lies behind and above the insertion of adductor longus).
3. adductor longus (inserted into the middle 1/3 of linea aspera).
4. opening in adductor magnus (transmits femoral vessels).
5. iliopsoas.
6. gracilis (the most medial muscle of the adductor group).
7. adductor magnus (the largest and most posterior; it separates the other adductors from the hamstring muscles on back of thigh).

✓ Fig.(143): NERVE SUPPLY OF PECTINEUS

It is supplied mainly from the femoral nerve and occasionally gets an additional branch from the obturator nerve. When the accessory obturator nerve is present it ends in the pectineus.

1. femoral nerve (main supply).
2. accessory obturator nerve (not always present).
3. branch from obturator nerve.
4. pectineus.

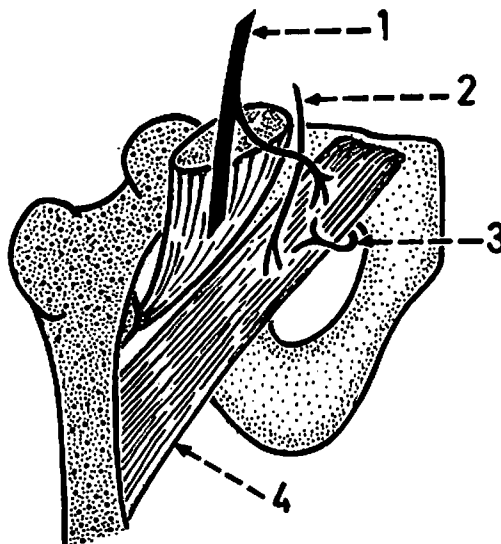


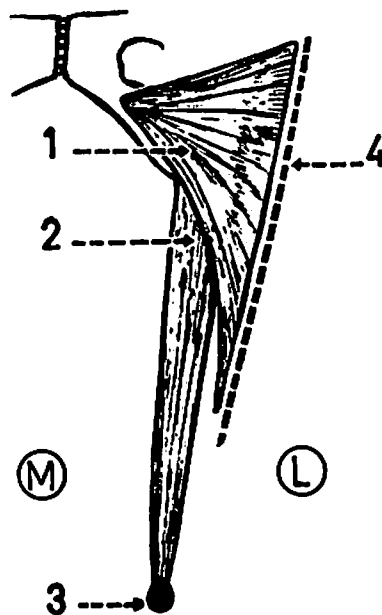
Fig.(144): PARTS OF ADDUCTOR MAGNUS

The muscle has 2 parts: pubic part and ischial part, each of which has its origin, insertion, action and nerve supply.

1. pubic part : arises from the side of pubic arch and is inserted into the gluteal tuberosity, linea aspera and medial supracondylar line.
2. ischial part : arises from the ischial tuberosity and is inserted into the adductor tubercle.
3. adductor tubercle.
4. line of insertion into the femur.

* The pubic part is fan-shaped with an upper horizontal border.

* The ischial part is vertical and lies partly behind the pubic part.



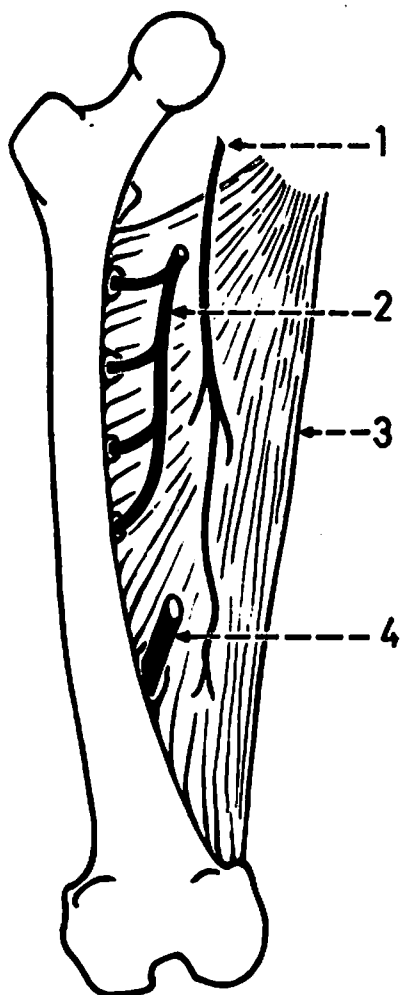


Fig.(145): ANTERIOR RELATIONS OF ADDUCTOR MAGNUS

These are mainly the terminal parts of the profunda femoris and femoral arteries as well as the posterior division of obturator nerve.

1. posterior division of obturator nerve.
2. profunda femoris artery with its 4 perforating branches.
3. adductor magnus.
4. terminal part of femoral artery.

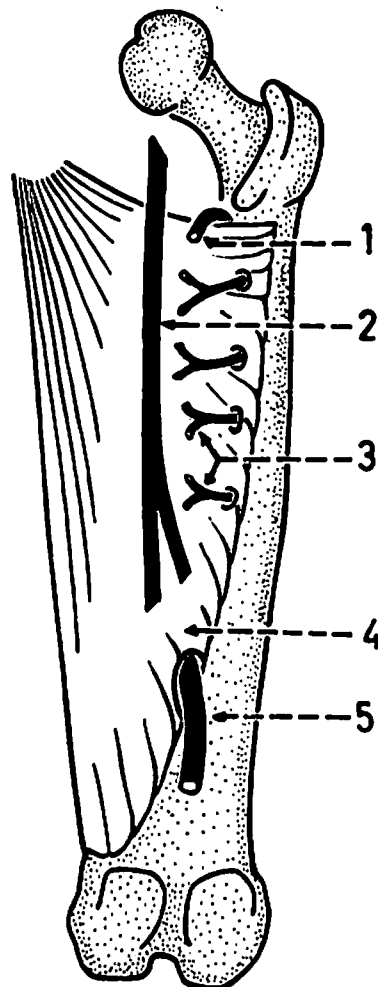


Fig.(146): POSTERIOR RELATIONS OF ADDUCTOR MAGNUS

These are mainly the sciatic nerve and its 2 terminal divisions as well as the longitudinal chain of anastomosis between the 4 perforating arteries.

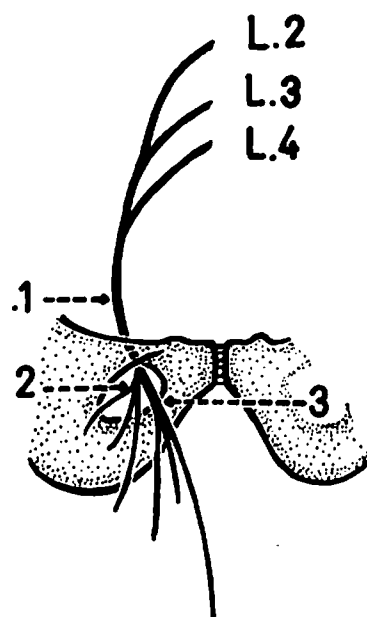
1. medial circumflex femoral artery (emerging at the upper border of adductor magnus).
2. sciatic nerve.
3. perforating arteries (after piercing the muscle).
4. adductor magnus.
5. popliteal artery.

OBTURATOR NERVE AND ARTERY

Fig.(147): COURSE OF OBTURATOR NERVE

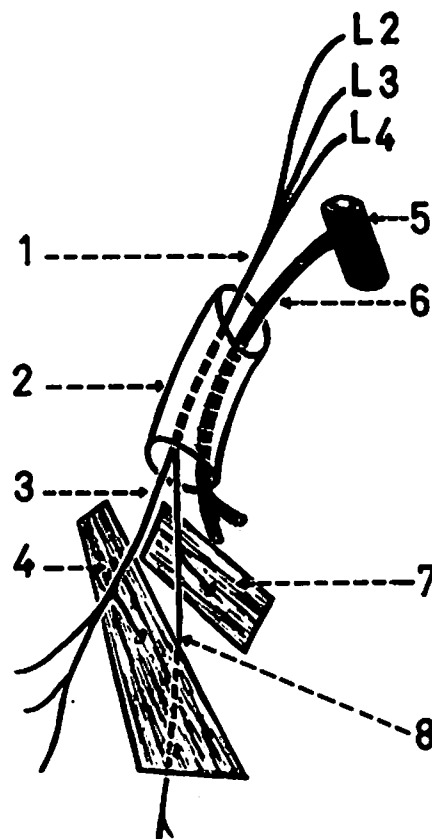
It arises from L.2,3,4 (anterior divisions) and passes through the obturator canal to enter the medial side of thigh.

1. obturator nerve (in the abdomen).
2. posterior division of the nerve.
3. anterior division of the nerve.



✓ Fig.(148): OBTURATOR NERVE AND ARTERY

1. obturator nerve.
 2. obturator canal.
 3. anterior division of the nerve.
 4. adductor brevis (behind the anterior division).
 5. internal iliac artery.
 6. obturator artery (from internal iliac).
 7. obturator externus (supplied by posterior division of obturator nerve).
 8. posterior division of the nerve (behind the adductor brevis).
- * The terminal divisions of the obturator artery end deep to the obturator externus by anastomosing together, while the divisions of the obturator nerve continue into the medial side of thigh.



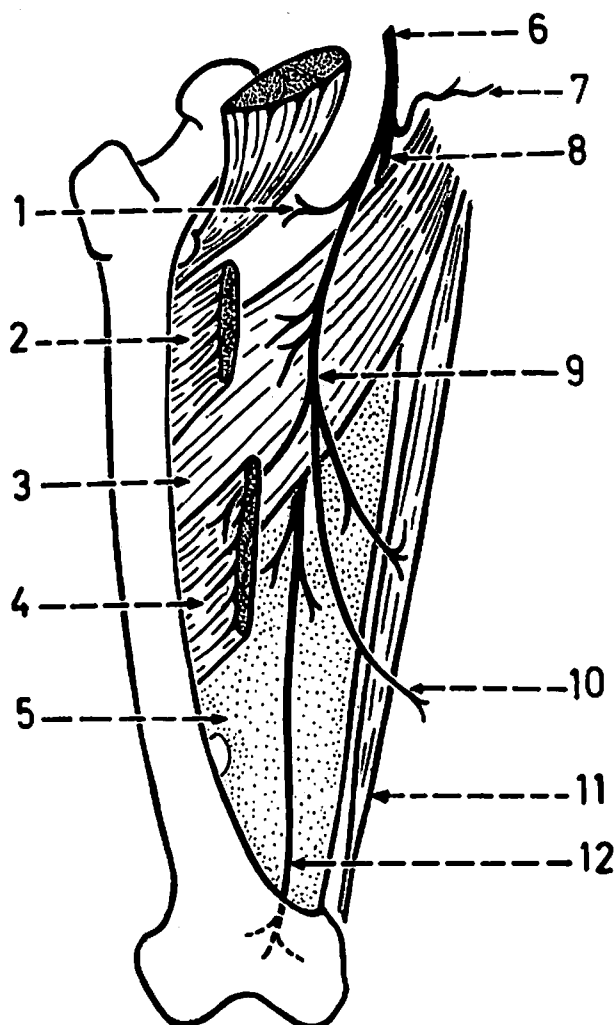


Fig.(149): DISTRIBUTION OF THE OBTURATOR NERVE

The anterior division of the nerve supplies 3 muscles (adductor longus, adductor brevis, gracilis), skin on the medial side of thigh and hip joint. The posterior division of the nerve supplies 2 muscles (pubic part of adductor magnus, obturator externus) and knee joint. Occasionally, the obturator nerve supplies the pectineus muscle.

1. articular branch to the hip joint.
2. pectineus.
3. adductor brevis (intervenes between the anterior and posterior divisions).
4. adductor longus.
5. adductor magnus.
6. trunk of obturator nerve.
7. branch to obturator externus.
8. posterior division of obturator nerve.
9. anterior division of obturator nerve.
10. cutaneous branch from anterior division.
11. gracilis.
12. articular branch to the knee from posterior division.

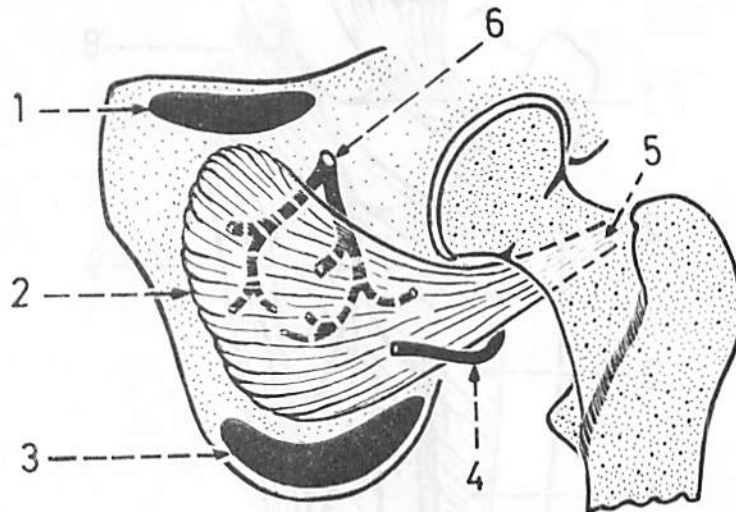


Fig.(150): OBTURATOR EXTERNUS MUSCLE

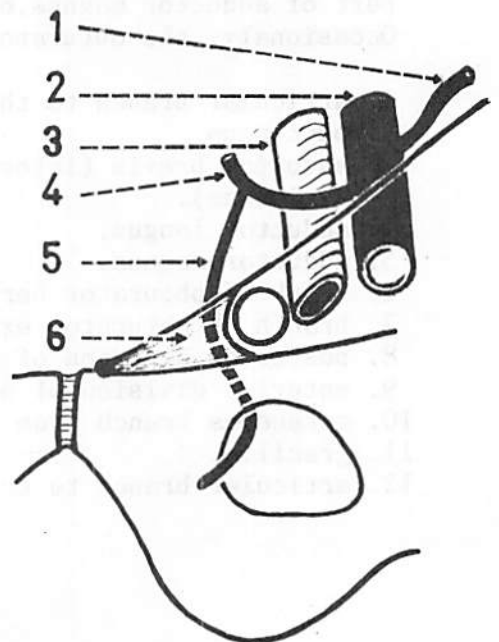
It is a fan-like muscle which arises from the outer surface of obturator membrane and adjoining margins of obturator foramen. Its tendon of insertion runs below the hip joint and on the middle of the back of the neck of femur to reach the trochanteric fossa.

1. origin of pectineus.
2. origin of obturator externus (wide origin).
3. origin of adductor magnus.
4. medial circumflex femoral artery winding round the lower border of obturator externus to reach the back of thigh.
5. tendon of insertion of obturator externus (on the back of the neck of femur).
6. anastomosis between the anterior and posterior divisions of the obturator artery deep to obturator externus (on the surface of the obturator membrane).

✓ Fig.(151): ABNORMAL OBTURATOR ARTERY

It is present in 30% of subjects and is formed by an enlarged anastomosis between the pubic branch of obturator artery and pubic branch of inferior epigastric artery. It runs behind the free margin of lacunar ligament.

1. deep circumflex iliac artery.
2. external iliac artery.
3. external iliac vein.
4. inferior epigastric artery.
5. abnormal obturator artery.
6. lacunar ligament.



GLUTEAL REGION

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Fig.(152):SURFACE LANDMARKS OF
GLUTEAL REGION

The gluteal region extends from the iliac crest above to the gluteal fold below.

1. skin dimple overlying the posterior superior iliac spine (opposite 2nd sacral spine).
2. natal cleft (between the 2 buttocks)..
3. buttock (the lower and posterior part of gluteal region).
4. gluteal fold (horizontal fold of skin marking the lower limit of gluteal region).

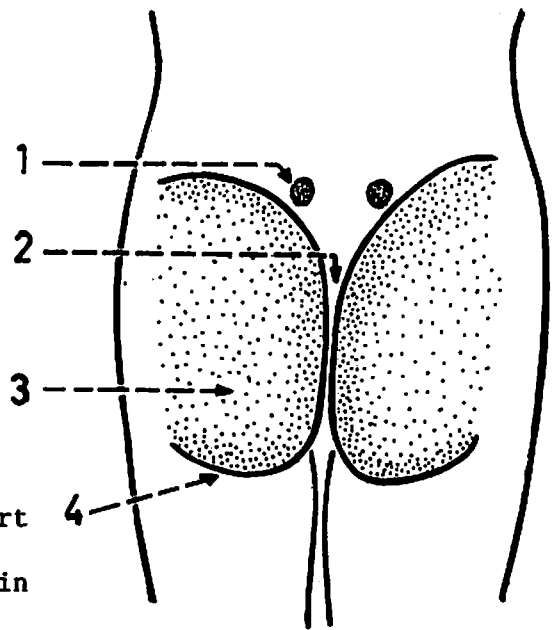


Fig.(153): CUTANEOUS NERVES OF
GLUTEAL REGION

The cutaneous nerves enter the region from all directions.

1. lateral branches of subcostal and iliohypogastric (from above).
2. posterior branch of lateral cutaneous nerve of thigh (from in front).
3. posterior rami of upper 3 lumbar nerves (from above).
4. posterior rami of upper sacral nerves (from behind).
5. gluteal branch of posterior cutaneous nerve of thigh (from below).
6. posterior cutaneous nerve of thigh.

* Note the rich cutaneous supply of the gluteal region.

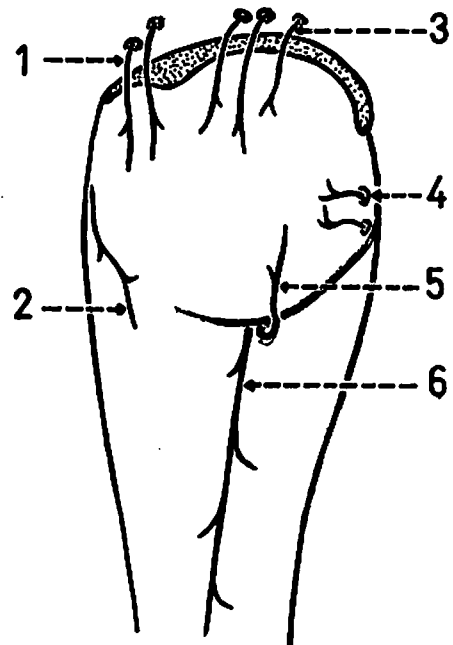
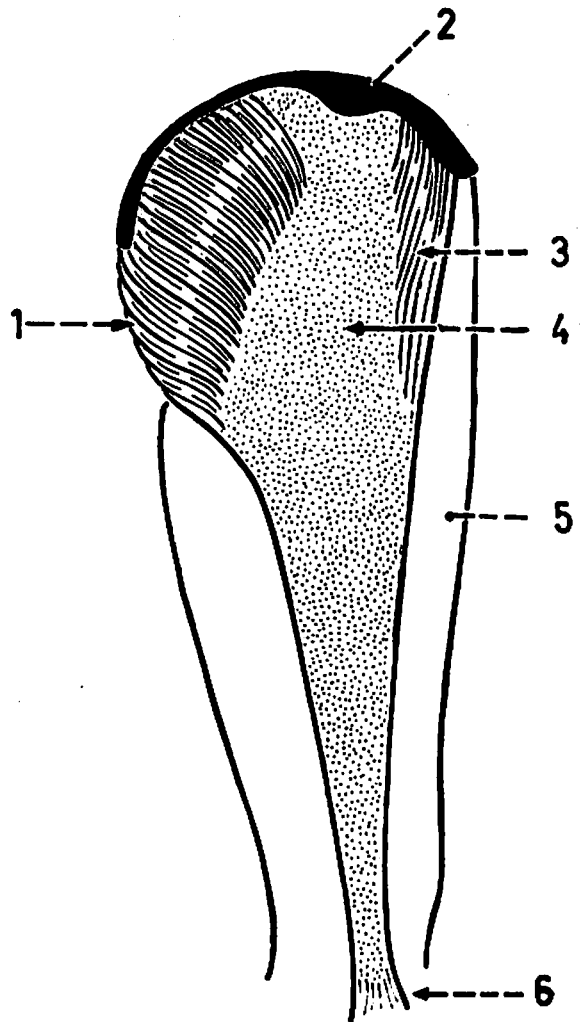


Fig.(154): ILIOTIBIAL TRACT

It is a thickening of deep fascia of thigh which receives the insertion of tensor fasciae latae in front and the superficial 3/4 of gluteus maximus behind.

1. gluteus maximus.
2. tubercle of iliac crest.
3. tensor fasciae latae.
4. iliotibial tract.
5. front of thigh.
6. attachment of the iliotibial tract to the lateral condyle of tibia.

Fig.(155): NERVE SUPPLY OF
TENSOR FASCIAE LATAE

It is supplied by the superior gluteal nerve which runs forwards between the gluteus medius and minimus to enter the tensor fasciae latae.

1. gluteus medius.
2. gluteus maximus (cut).
3. superior gluteal nerve and artery.
4. tensor fasciae latae.
5. gluteus minimus.
6. line intervening between muscles of gluteal region (supplied by superior gluteal and inferior gluteal nerves) and muscles of the front of thigh (supplied by femoral nerve).

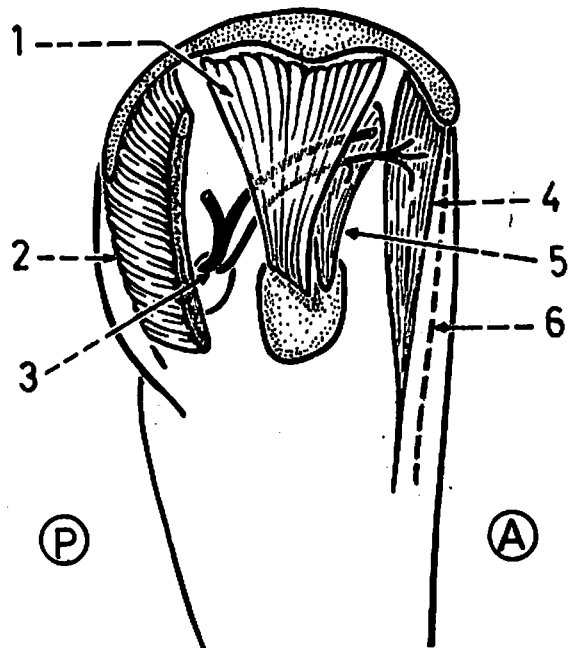


Fig.(156): GLUTEUS MAXIMUS

It is the thickest and most superficial muscle in the gluteal region. Its upper border is oblique and crosses over the gluteus medius.

1. upper oblique border.
2. inferior gluteal nerve entering the deep surface of the muscle.
3. iliotibial tract overlying the greater trochanter.
4. origin from gluteal surface of ilium.
5. origin from back of sacrum.
6. origin from sacrotuberous ligament.
7. lower oblique border.

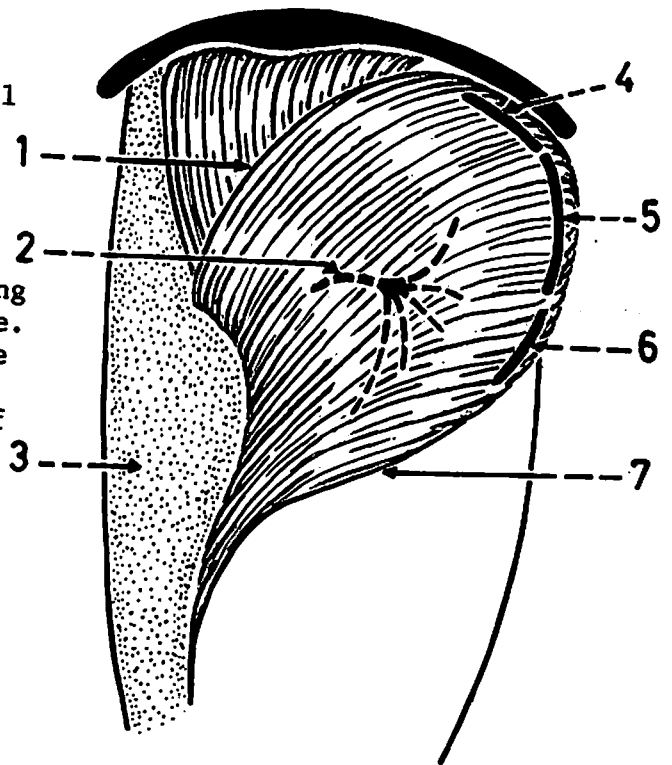


Fig.(157): BONY PROMINENCES AND BURSAE UNDER COVER OF GLUTEUS MAXIMUS

1. greater trochanter.
2. bursa on greater trochanter.
3. bursa on upper part of vastus lateralis.
4. ischial tuberosity.
5. bursa on ischial tuberosity.

* The greater trochanter and ischial tuberosity are the 2 bony prominences present under cover of the gluteus maximus.

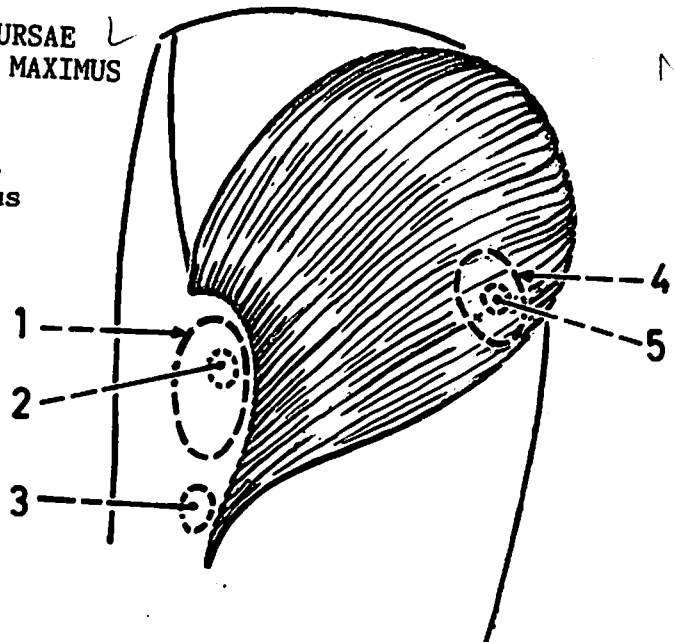


Fig.(158): NERVES UNDER COVER OF GLUTEUS MAXIMUS

These are the sciatic, superior gluteal, inferior gluteal and pudendal nerve in addition to nerve to obturator internus, nerve to quadratus femoris and posterior cutaneous nerve of thigh.

1. gluteus medius.
2. tensor fasciae latae.
3. superior gluteal nerve.
4. sciatic nerve.
5. gluteus maximus.
6. pudendal nerve, nerve to obturator internus and internal pudendal artery.
7. inferior gluteal nerve.
8. nerve to quadratus femoris.
9. long head of biceps (between sciatic nerve and posterior cutaneous nerve of thigh).
10. posterior cutaneous nerve of thigh.

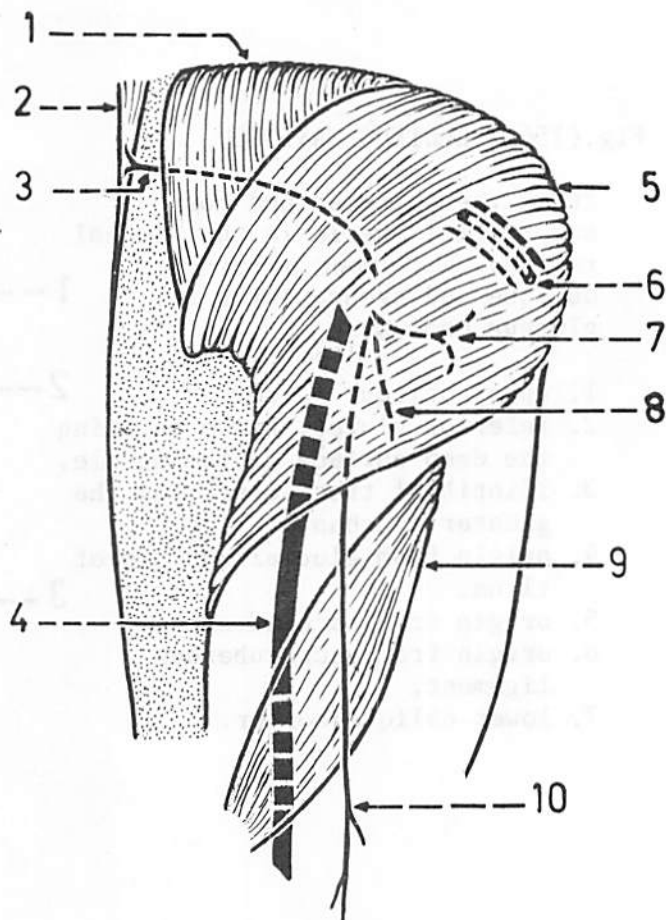


Fig.(159): MUSCLES CROSSED BY UPPER AND LOWER BORDERS OF THE GLUTEUS MAXIMUS

The oblique upper border crosses over the gluteus medius, while the oblique lower border crosses over the origin of hamstring muscles.

1. gluteus medius (site for intramuscular injection).
2. gluteus maximus (its fibres run obliquely downwards and laterally).
3. iliotibial tract.
4. long head of biceps.
5. semimembranosus.
6. semitendinosus.

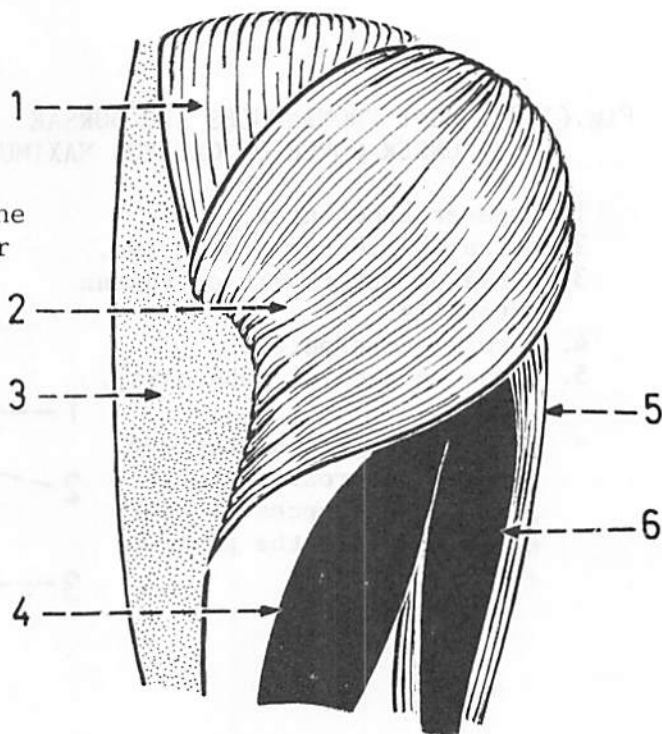


Fig.(160): MUSCLES DEEP TO
GLUTEUS MAXIMUS

These muscles are gluteus medius and minimus, piriformis, tendon of obturator internus, the 2 gemelli and quadratus femoris.

1. gluteus minimus (deep to gluteus medius).
2. gluteus medius (cut).
3. quadratus femoris.
4. adductor magnus.
5. sciatic nerve.
6. piriformis (passing through greater sciatic foramen).
7. sacrotuberous ligament.
8. tendon of obturator internus and the 2 gemelli.
9. ischial tuberosity.
10. long head of biceps.

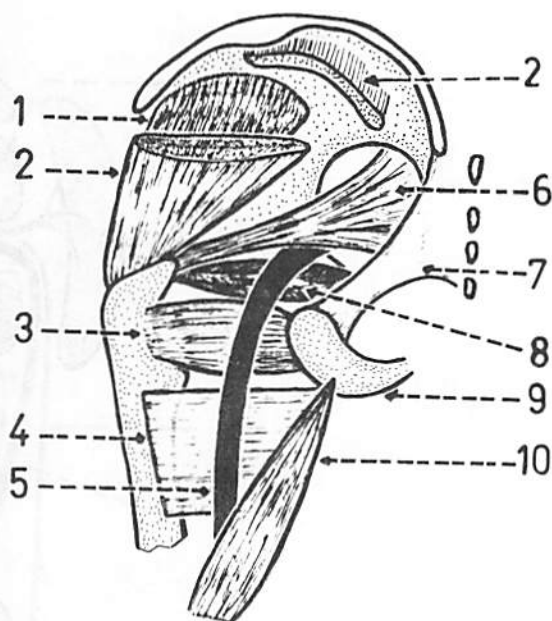
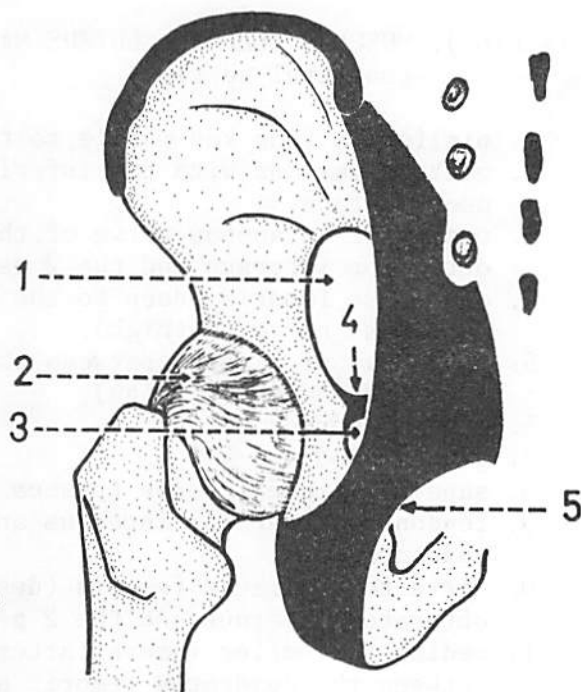


Fig.(161): LIGAMENTS DEEP TO
GLUTEUS MAXIMUS

These ligaments are the sacrotuberous and sacrospinous ligaments. They bound the greater and lesser sciatic foramina.

1. greater sciatic foramen.
2. back of capsule of hip joint.
3. lesser sciatic foramen.
4. sacrospinous ligament.
5. sacrotuberous ligament.

* The sacrospinous ligament lies under cover of the sacrotuberous ligament.



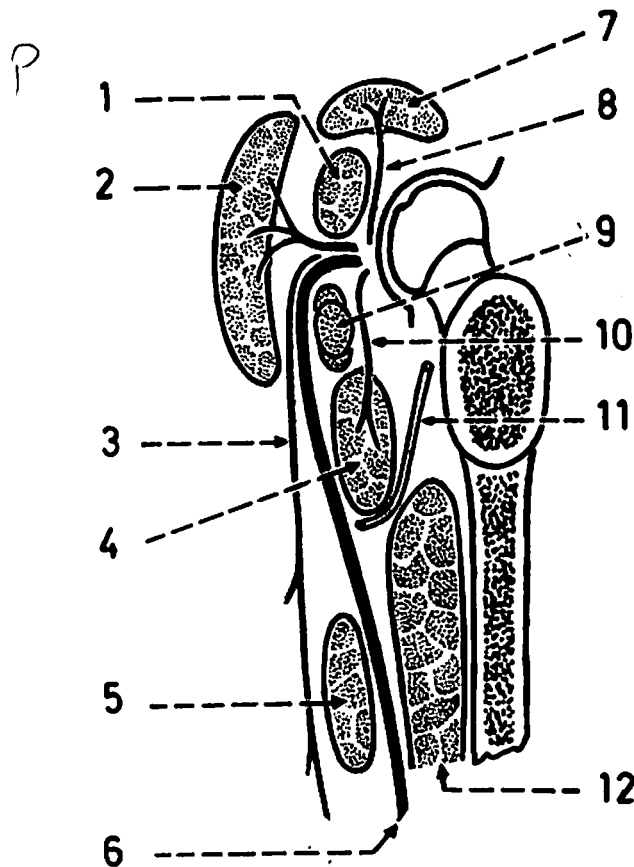


Fig.(162): MUSCLES DEEP TO GLUTEUS MAXIMUS AND RELATED NERVES
(sagittal section)

1. piriformis (the key muscle to the gluteal region).
2. gluteus maximus with the inferior gluteal nerve entering its deep surface.
3. posterior cutaneous nerve of thigh (descends over the tendon of obturator internus and the 2 gemelli).
4. quadratus femoris (deep to the sciatic nerve and posterior cutaneous nerve of thigh).
5. long head of biceps (between the sciatic nerve and posterior cutaneous nerve of thigh).
6. sciatic nerve.
7. gluteus medius.
8. superior gluteal nerve (passes above the piriformis).
9. tendon of obturator internus and the 2 gemelli (superior and inferior).
10. nerve to quadratus femoris (descends deep to the tendon of obturator internus and the 2 gemelli).
11. medial circumflex femoral artery (reaches the back of thigh between the quadratus femoris and adductor magnus).
12. adductor magnus.

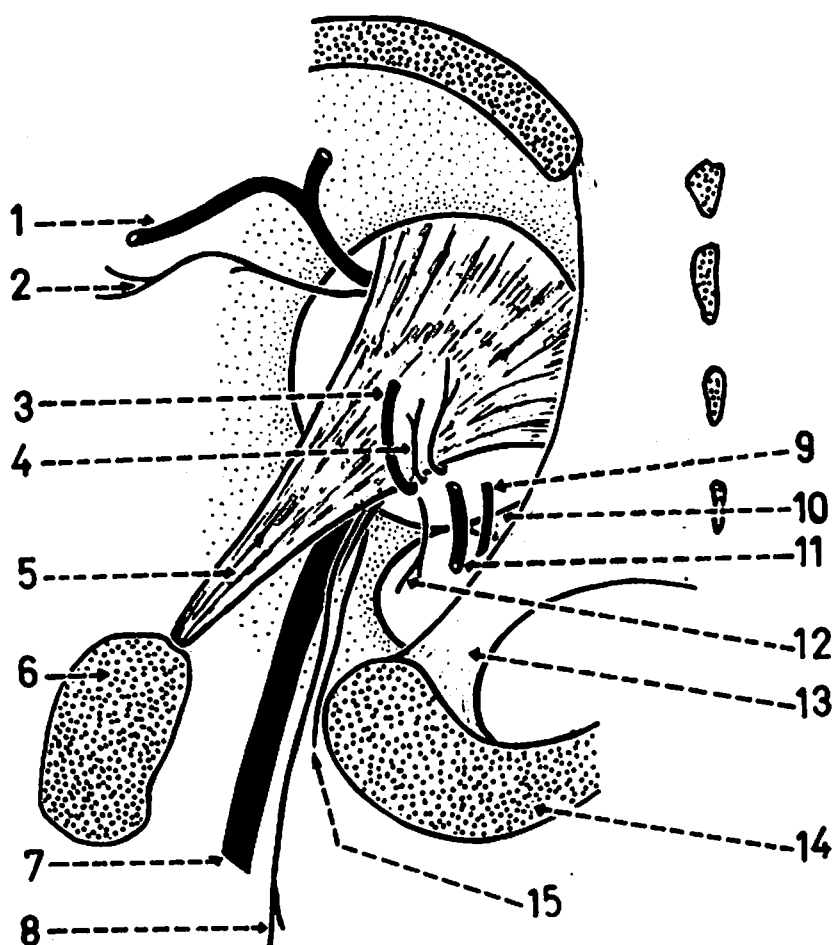
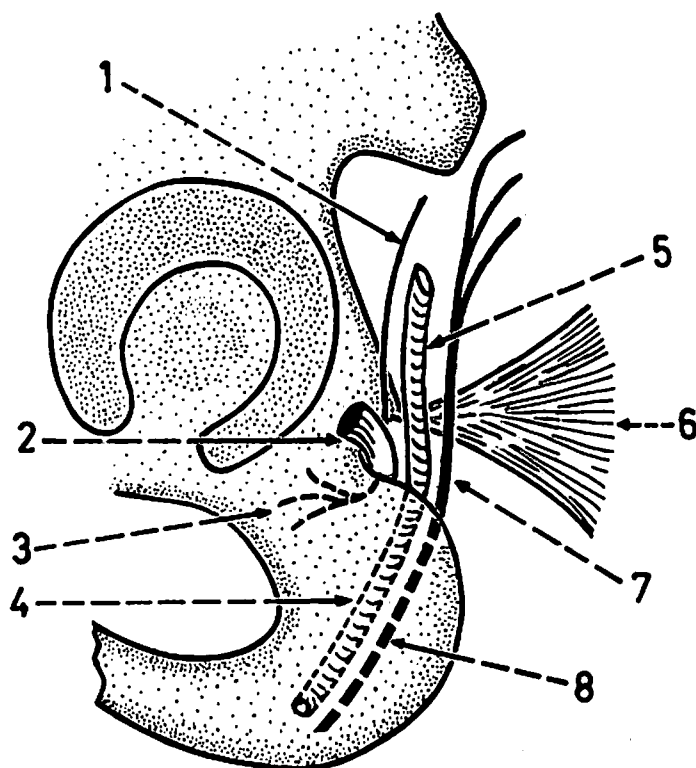


Fig.(163): STRUCTURES PASSING THROUGH THE GREATER SCIATIC FORAMEN

These structures are the piriformis together with nerves and vessels above and below the muscle.

1. superior gluteal artery (above piriformis).
2. superior gluteal nerve (above piriformis).
3. inferior gluteal artery (below piriformis).
4. inferior gluteal nerve (below piriformis).
5. piriformis (pear-shaped muscle inserted into the top of greater trochanter).
6. greater trochanter.
7. sciatic nerve (passes midway between greater trochanter and ischial tuberosity).
8. posterior cutaneous nerve of thigh.
9. pudendal nerve (passes from the greater to the lesser sciatic foramen).
10. sacrospinous ligament.
11. internal pudendal artery (passes from the greater to the lesser sciatic foramen).
12. nerve to obturator internus (passes from the greater to the lesser sciatic foramen).
13. sacrotuberous ligament.
14. ischial tuberosity.
15. nerve to quadratus femoris.



✓ Fig.(164): STRUCTURES PASSING THROUGH THE LESSER SCIATIC FORAMEN

These are the tendon of obturator internus, internal pudendal artery, pudendal nerve and nerve to obturator internus.

1. nerve to obturator internus (crosses the base of ischial spine).
2. tendon of obturator internus (passing to its insertion into the greater trochanter).
3. termination of the nerve to obturator internus in the muscle.
4. internal pudendal artery (in the pudendal canal).
5. internal pudendal artery passing from the greater to the lesser sciatic foramen (crosses the tip of ischial spine).
6. sacrospinous ligament (attached to the ischial spine).
7. pudendal nerve passing from the greater to the lesser sciatic foramen (crosses the sacrospinous ligament).
8. pudendal nerve (in the pudendal canal).

Fig.(165): GLUTEUS MEDIUS AND MINIMUS

The gluteus medius and minimus lie under cover of gluteus maximus directly above the piriformis. The gluteus minimus is deep to and completely hidden by the gluteus medius.

1. gluteus minimus.
2. gluteus medius (cut).
3. piriformis (lies edge to edge with the gluteus medius).
4. sacrotuberous ligament.

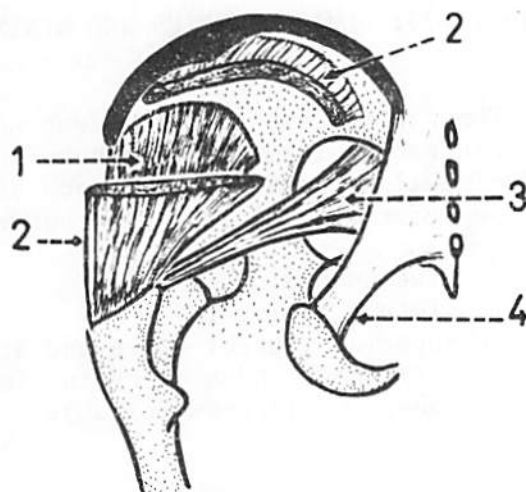
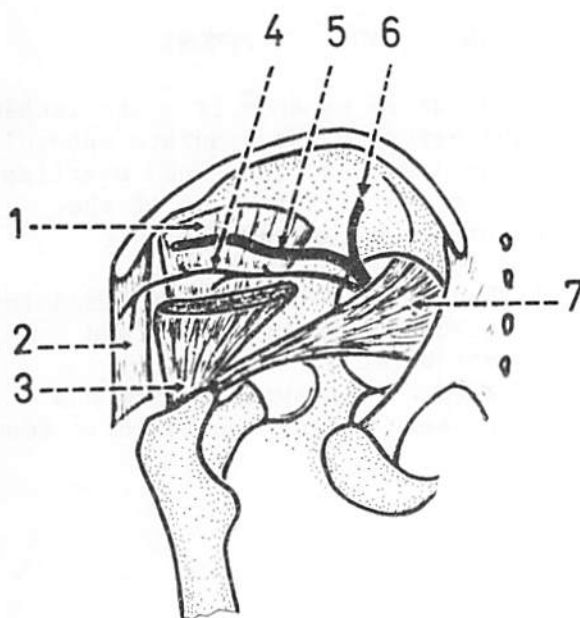


Fig.(166): SUPERIOR GLUTEAL NERVE AND ARTERY

The superior gluteal nerve and artery enter the gluteal region above the piriformis. The nerve together with the deep branch of the artery run forwards between the gluteus medius and minimus.

1. gluteus minimus.
2. tensor fasciae latae.
3. gluteus medius.
4. superior gluteal nerve (ends in tensor fasciae latae).
5. deep branch of superior gluteal artery.
6. superficial branch of superior gluteal artery (enters gluteus maximus).
7. piriformis.



* The superior gluteal nerve supplies 3 muscles: gluteus medius, gluteus minimus and tensor fasciae latae.

Fig.(167): GLUTEUS MEDIUS AND MINIMUS
(anterior view)

The gluteus minimus lies deep to the gluteus medius with the superior gluteal nerve and deep branch of superior gluteal artery in between.

1. gluteus medius.
2. gluteus minimus.
3. superior gluteal nerve and artery.
4. reflected tendon of rectus femoris (deep to gluteus minimus).

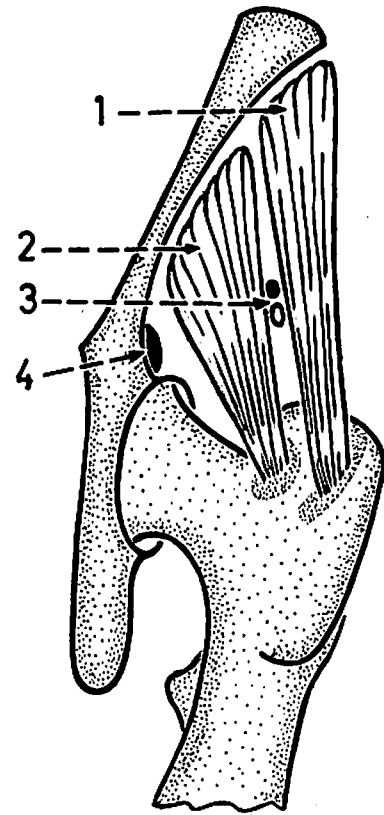


Fig.(168): QUADRATUS FEMORIS

This muscle extends from the ischial tuberosity to the quadrate tubercle of greater trochanter and overlies the tendon of insertion of the obturator externus.

1. back of the capsule of hip joint.
2. quadratus femoris (cut and reflected).
3. tendon of obturator externus passing to the trochanteric fossa.

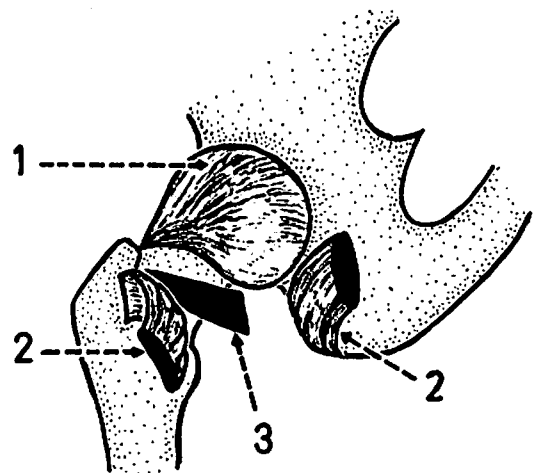


Fig.(169): OBTURATOR EXTERNUS

It is a fan-shaped muscle which arises from the outer aspect of the obturator membrane and adjoining bone. It has a narrow tendon of insertion which winds round the neck of femur.

1. origin of the muscle.
2. tendon of insertion.
3. greater trochanter.

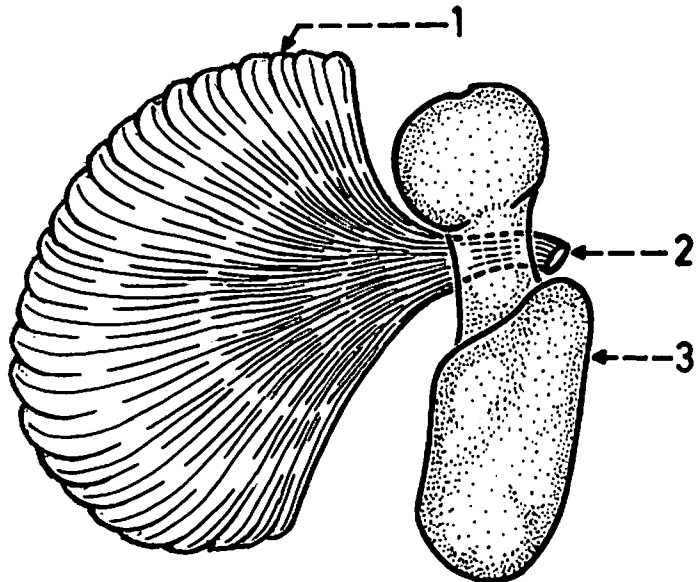
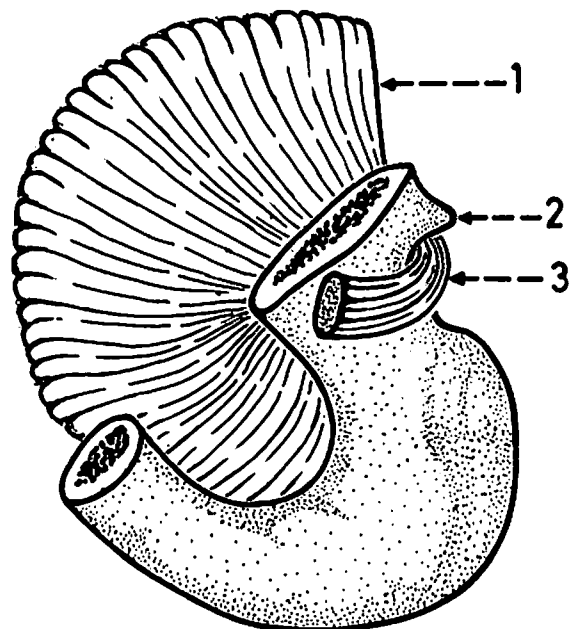


Fig.(170): OBTURATOR INTERNUS

It is also a fan-like muscle which arises from the inner aspect of the obturator membrane and adjoining bone. Its tendon of insertion winds round the back of the ischium (in the lesser sciatic foramen).

1. origin of the muscle.
2. ischial spine.
3. tendon of insertion.

* The obturator internus and externus muscles are the main lateral rotators of the hip joint.



SCIATIC NERVE

✓ Fig.(171): DEEP RELATIONS OF
SCIATIC NERVE

These are as follows (from above downwards): back of ischium, tendon of obturator internus and the 2 gemelli, quadratus femoris and adductor magnus.

1. gluteus maximus (cut).
2. tendon of obturator internus and the 2 gemelli.
3. ischial tuberosity.
4. sciatic nerve.
5. adductor magnus.
6. gluteus medius.
7. piriformis.
8. greater trochanter.
9. quadratus femoris.

* Note that the sciatic nerve lies midway between the ischial tuberosity and greater trochanter, and that it ends at the middle of the thigh by dividing into tibial and common peroneal nerves.

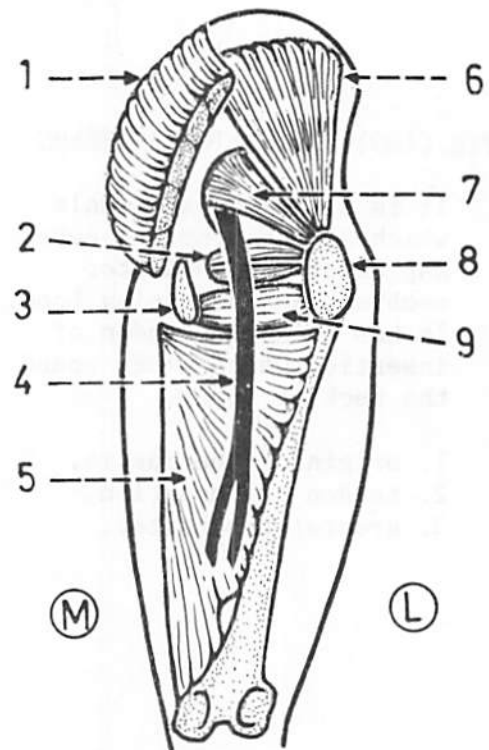


Fig.(172): RELATION OF SCIATIC NERVE TO
BACK OF ISCHIUM

As the sciatic nerve leaves the greater sciatic foramen it lies directly on the back of ischium with 2 nerves related to it: posterior cutaneous nerve of thigh superficial to it and nerve to quadratus femoris deep to it.

1. back of capsule of hip joint.
2. posterior cutaneous nerve of thigh.
3. nerve to quadratus femoris.
4. sciatic nerve.

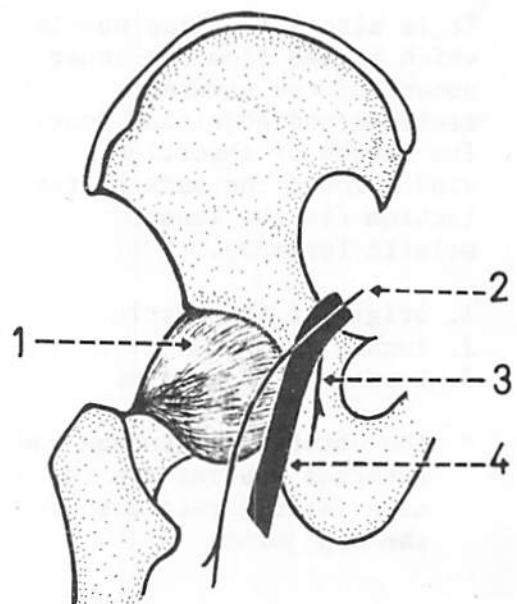


Fig.(173): SURFACE ANATOMY OF
SCIATIC NERVE

It is represented by a line drawn through 3 points:

Point (a): at 2.5 cm (1 inch) lateral to the midpoint between ischial tuberosity and posterior superior iliac spine.

Point (b): midway between the greater trochanter and ischial tuberosity.

Point (c): at the middle of the back of the thigh or at the apex of popliteal fossa.

1. greater trochanter.
2. popliteal fossa.
3. posterior superior iliac spine.
4. ischial tuberosity.

* The area directly above the greater trochanter is clearly away from the course of sciatic nerve and thus it is safe for intramuscular injection.

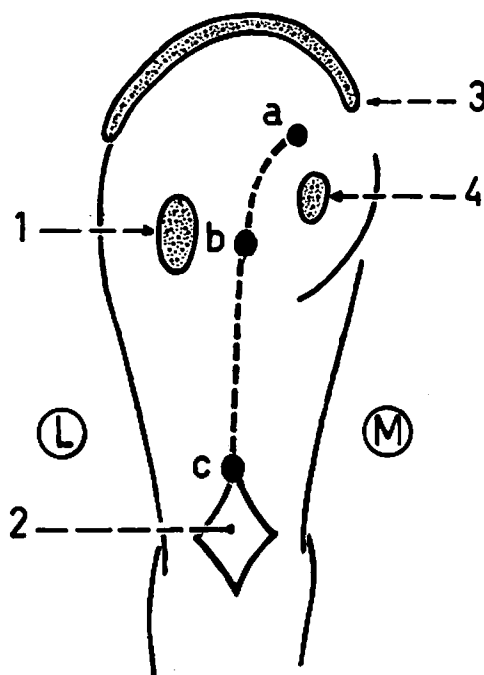
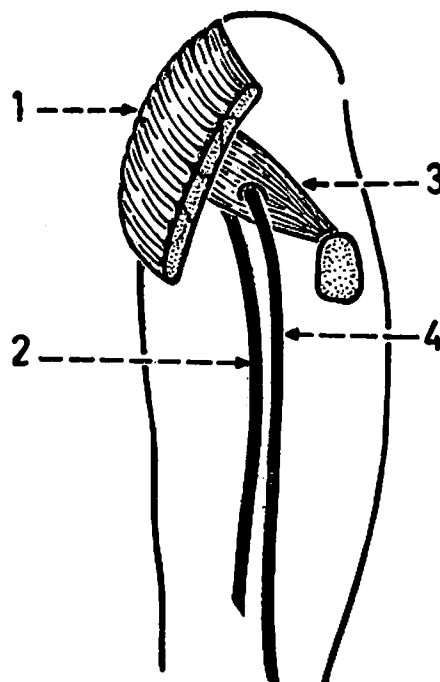


Fig.(174): HIGH DIVISION OF SCIATIC NERVE

The sciatic nerve may divide high up in the pelvis and in such a case the tibial division passes below the piriformis while the common peroneal division pierces the muscle.

1. gluteus maximus (cut).
2. tibial division (below piriformis).
3. piriformis.
4. common peroneal division (piercing piriformis).



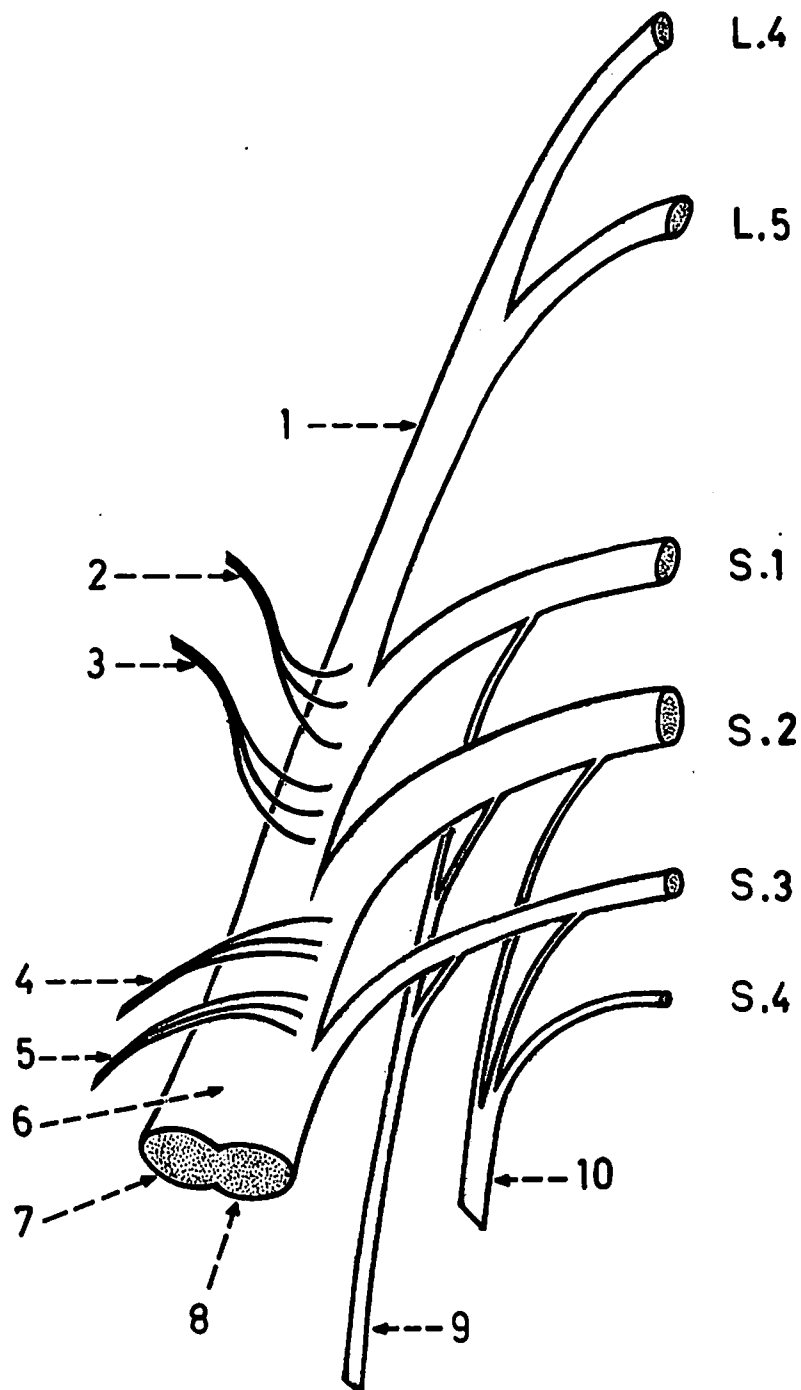


Fig.(175): ORIGIN OF NERVES IN THE GLUTEAL REGION FROM SACRAL PLEXUS

The sacral plexus lies in the pelvis and its branches to the gluteal region pass through the greater sciatic foramen.

- | | |
|---------------------------------|---|
| 1. lumbosacral trunk. | 6. sciatic nerve (L.4,5;S.1,2,3). |
| 2. superior gluteal nerve. | 7. tibial part of sciatic nerve. |
| 3. inferior gluteal nerve. | 8. common peroneal part of sciatic nerve. |
| 4. nerve to obturator internus. | 9. posterior cutaneous nerve of thigh. |
| 5. nerve to quadratus femoris. | 10. pudendal nerve (S.2,3,4). |

BACK OF THIGHFig.(176): MUSCLES OF THE
BACK OF THIGH

These are the biceps femoris, semitendinosus and semimembranosus. They are called together the hamstrings.

1. gluteus maximus (cut).
2. ischial tuberosity.
3. ischial part of adductor magnus.
4. semitendinosus.
5. semimembranosus.
6. insertion of adductor magnus into adductor tubercle.
7. insertion of semimembranosus.
8. insertion of semitendinosus.
9. gluteus medius.
10. gluteus minimus.
11. piriformis.
12. greater trochanter.
13. pubic part of adductor magnus.
14. insertion of gluteus maximus into gluteal tuberosity.
15. long head of biceps femoris.
16. insertion of biceps femoris.

* The semimembranosus and semitendinosus form the upper medial boundary of popliteal fossa, while the biceps femoris forms its upper lateral boundary.

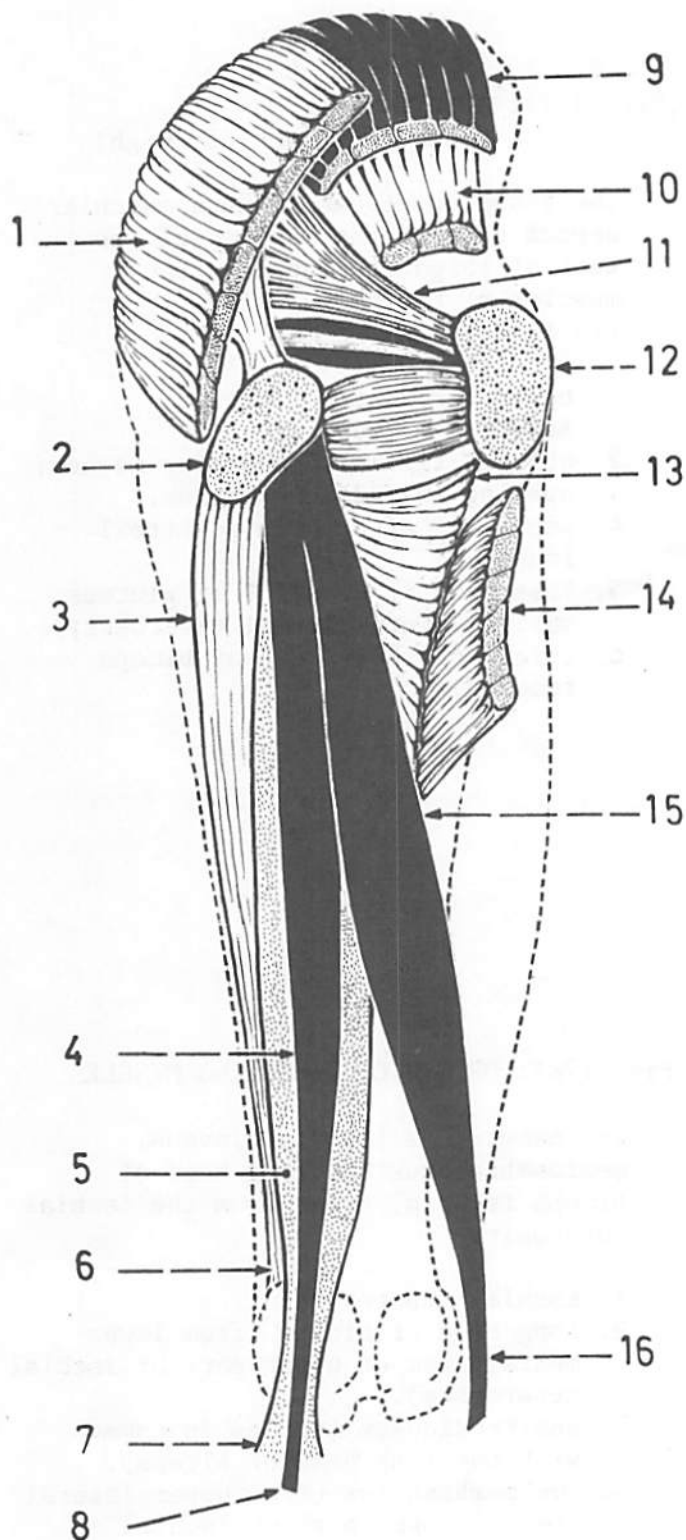


Fig.(177): ADDUCTOR MAGNUS
(seen from back of thigh)

The adductor magnus forms a muscular septum between the muscles of the back of thigh (behind) and the muscles of the medial side (in front).

1. upper horizontal fibres of adductor magnus.
2. oblique fibres of adductor magnus.
3. opening in adductor magnus.
4. popliteal artery (in popliteal fossa).
5. insertion of deep 1/4 of gluteus maximus (into gluteal tuberosity).
6. origin of short head of biceps femoris.

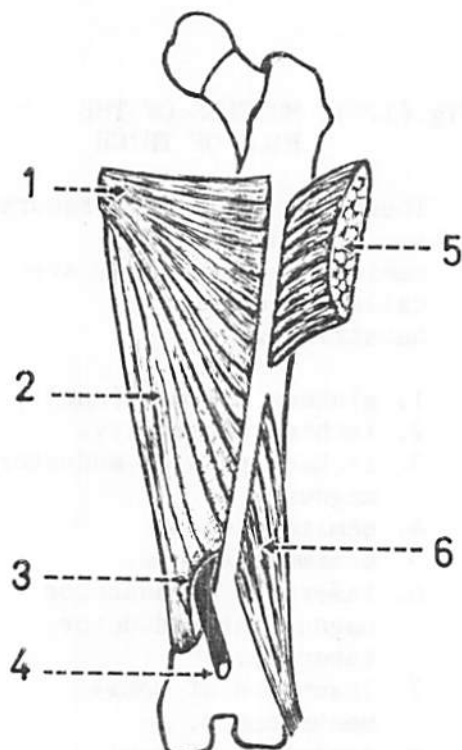
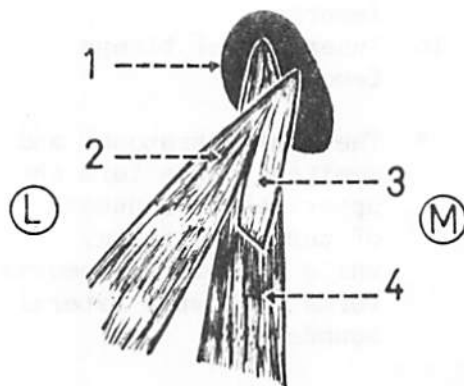


Fig.(178): ORIGIN OF HAMSTRING MUSCLES

The hamstrings (semitendinosus, semimembranosus and long head of biceps femoris) arise from the ischial tuberosity.

1. ischial tuberosity.
2. long head of biceps (from lower medial area of upper part of ischial tuberosity).
3. semitendinosus (arises in common with the long head of biceps).
4. semimembranosus (from upper lateral area of upper part of ischial tuberosity).



* The origin of hamstring muscles is covered by the lower border of gluteus maximus.

Fig.(179): SCIATIC NERVE IN THE BACK OF THIGH

In the back of thigh the sciatic nerve lies between the adductor magnus (deep to it) and the long head of biceps (superficial to it). It ends in the middle of the back of thigh by giving off its 2 terminal divisions.

1. adductor magnus.
2. long head of biceps.
3. short head of biceps.
4. common peroneal nerve (along the medial border of biceps femoris).
5. sciatic nerve.
6. semimembranosus.
7. semitendinosus.
8. tibial nerve (runs in the midline).

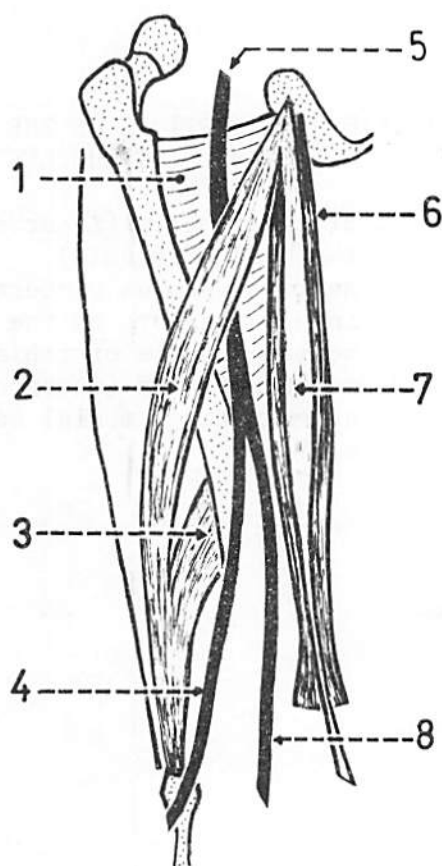


Fig.(180): BRANCHES OF SCIATIC NERVE

The sciatic nerve gives off all its branches in the back of thigh (none in the gluteal region). It supplies the 3 hamstring muscles and the ischial part of adductor magnus (from its trunk).

1. back of capsule of hip joint.
2. long head of biceps.
3. branch to short head of biceps.
4. sciatic nerve in gluteal region.
5. semimembranosus.
6. semitendinosus.
7. branch to adductor magnus.
8. terminal divisions of sciatic.

* Each head of the biceps receives a separate branch from the sciatic nerve.

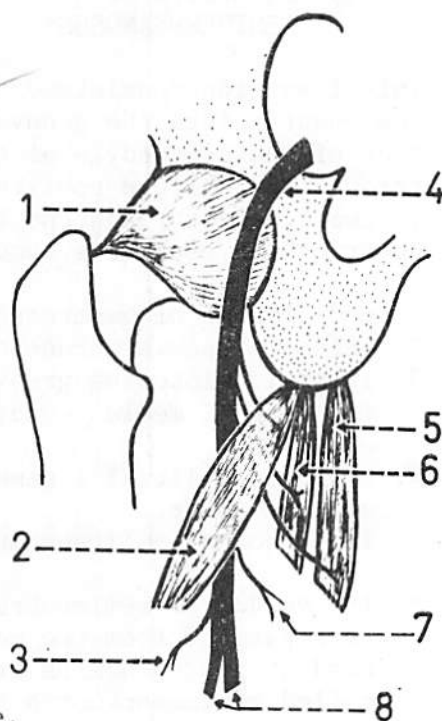


Fig.(181): INSERTIONS OF THE
HAMSTRING MUSCLES

1. biceps femoris (inserted into the head of fibula).
2. semimembranosus (inserted mainly into the groove on the back of medial condyle of tibia).
3. semitendinosus (inserted into the upper part of medial surface of tibia).

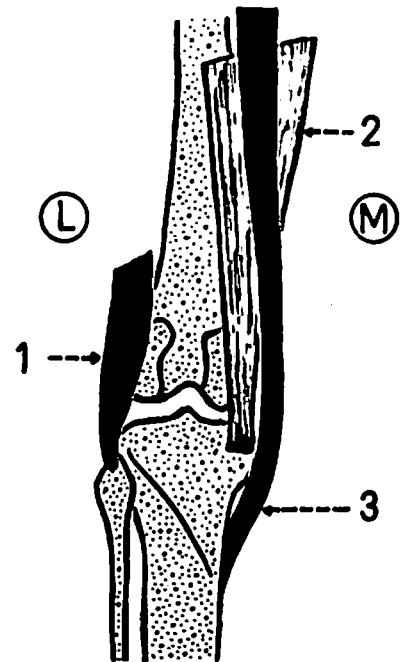
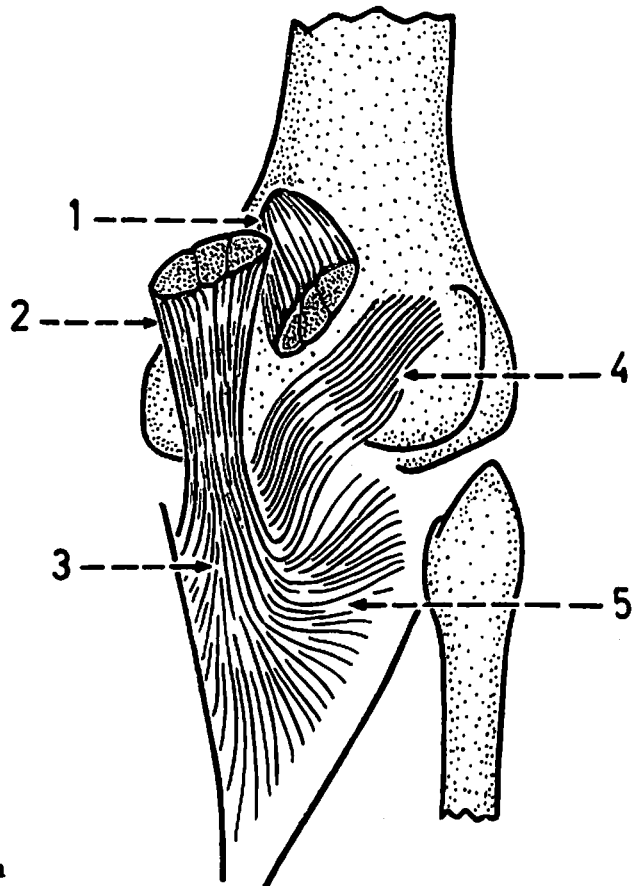


Fig.(182): INSERTION OF
SEMIMEMBRANOSUS

This insertion consists of several components: into the groove on the back of medial condyle of tibia, through the oblique popliteal ligament, and through the fascia covering the popliteus muscle.

1. medial head of gastrocnemius.
2. tendon of semimembranosus.
3. insertion into the groove on the back of medial condyle of tibia.
4. oblique popliteal ligament of knee joint.
5. fascia over popliteus muscle.

* The tendon of semimembranosus is separated from the medial head of gastrocnemius by a bursa called semimembranosus bursa.



POPLITEAL FOSSA

Fig.(183): BOUNDARIES OF POPLITEAL FOSSA

The popliteal fossa is a diamond-shaped space bounded by: biceps femoris (above and lateral), semitendinosus and semimembranosus (above and medial), lateral head of gastrocnemius and plantaris (below and lateral) and medial head of gastrocnemius (below and medial).

1. biceps femoris.
2. plantaris.
3. lateral head of gastrocnemius.
4. semimembranosus.
5. semitendinosus.
6. medial head of gastrocnemius.

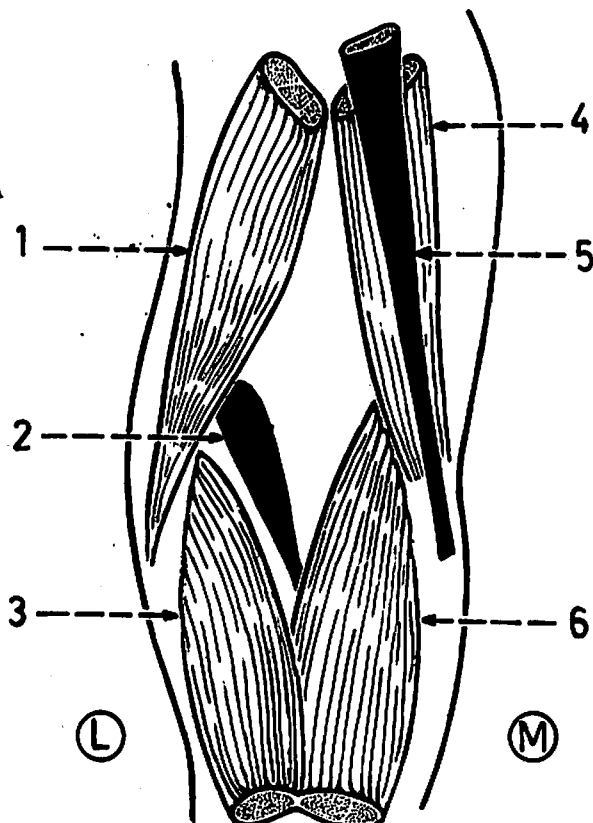
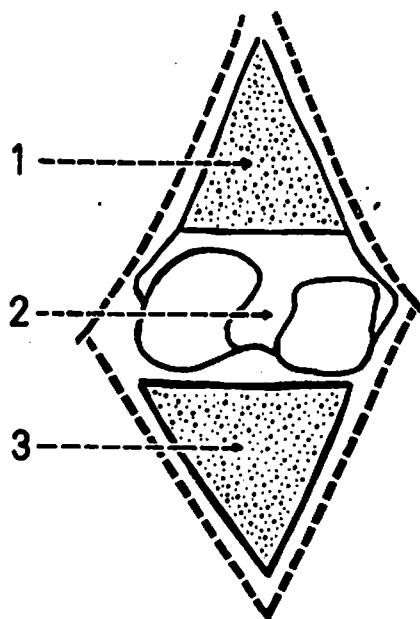


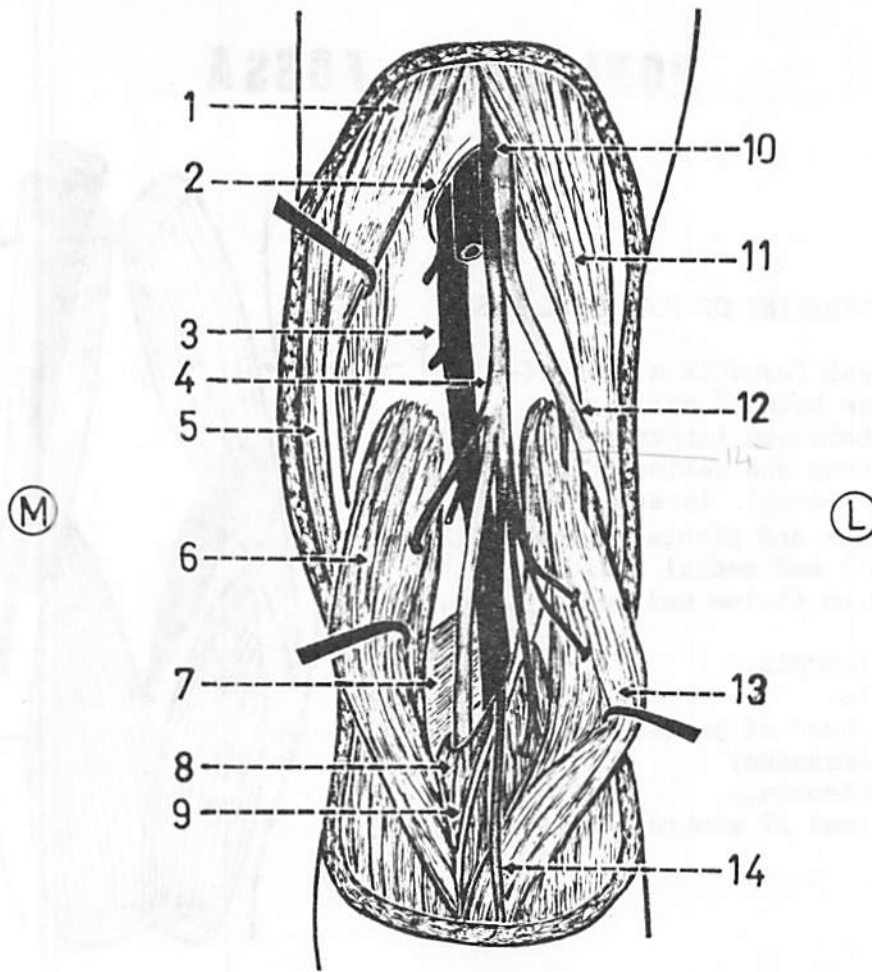
Fig.(184): FLOOR OF POPLITEAL FOSSA

It is formed by popliteal surface of the femur, capsule of knee joint and the popliteus with its covering fascia (from above downwards).

1. popliteal surface of femur.
2. back of knee joint.
3. popliteus muscle and its fascia.

* The roof of the fossa is formed by deep fascia called popliteal fascia.





✓ Fig.(185): CONTENTS OF POPLITEAL FOSSA

These are the popliteal artery and vein, tibial nerve, common peroneal nerve, lymph nodes and fat.

1. semitendinosus.
2. opening in adductor magnus transmitting the popliteal vessels.
3. popliteal artery (the deepest content, in direct contact with the floor of the fossa).
4. tibial nerve (descends in the midline of the fossa superficial to the popliteal vein).
5. semimembranosus.
6. medial head of gastrocnemius.
7. popliteus (behind the popliteal vessels and tibial nerve).
8. upper part of soleus muscle (crossing over the popliteal vessels and tibial nerve).
9. tendon of plantaris (a narrow long tendon between the soleus and gastrocnemius, may be absent).
10. lower end of sciatic nerve.
11. biceps femoris.
12. common peroneal nerve (descends along the upper lateral boundary of the fossa).
13. lateral head of gastrocnemius.
- 14. sural nerve.

14. Sural Communicating

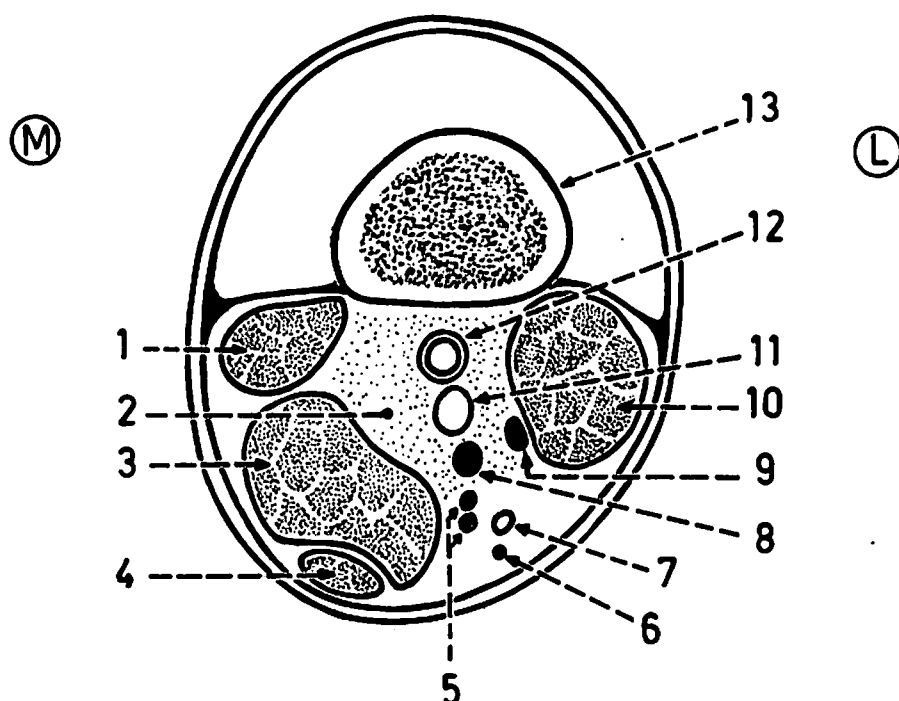


Fig.(186): CONTENTS OF POPLITEAL FOSSA IN CROSS-SECTION

This section is at the centre of the popliteal fossa. At this level the tibial nerve lies superficial to the popliteal vessels.

1. medial head of gastrocnemius.
2. fat in popliteal fossa.
3. semimembranosus.
4. semitendinosus.
5. popliteal lymph nodes (close to the end of small saphenous vein).
6. posterior cutaneous nerve of thigh (in the midline, just beneath the deep fascia).
7. termination of small (short) saphenous vein.
8. tibial nerve (in the midline, superficial to the popliteal vein).
9. common peroneal nerve (along the medial border of biceps femoris).
10. biceps femoris.
11. popliteal vein (superficial to the popliteal artery, between it and the tibial nerve).
12. popliteal artery (the deepest content, in direct contact with the floor of the fossa).
13. T.S. in the lower part of the femur.

* In the upper end of the fossa the tibial nerve is lateral to the popliteal vessels from which it is separated by a distance, but in the centre of the fossa the nerve crosses superficial to the vessels.

POPLITEAL ARTERY

Fig.(187): COURSE OF POPLITEAL ARTERY

It begins at the opening in the adductor magnus as a continuation of the femoral artery, descends on the floor of the fossa and ends at the lower border of popliteus by dividing into anterior and posterior tibial arteries.

1. popliteal artery.
2. back of the capsule of knee joint.
3. popliteus muscle.
4. posterior tibial artery.
5. anterior tibial artery.
6. popliteal surface of femur.
7. opening in adductor magnus.

* The artery lies over the back of femur, back of capsule of knee joint and popliteus (from above downwards).

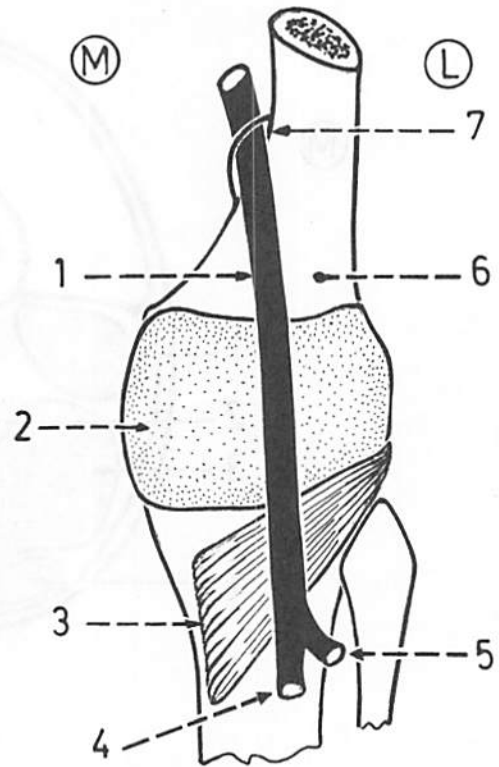


Fig.(188): RELATION OF THE POPLITEAL ARTERY TO THE TIBIAL NERVE

At the superior angle of the fossa the tibial nerve is lateral to the artery, then crosses superficial to it in the middle of the fossa to come medial to it below.

1. beginning of popliteal artery (medial to the nerve).
2. popliteus.
3. tibial nerve.
4. termination of sciatic nerve.
5. common peroneal nerve.

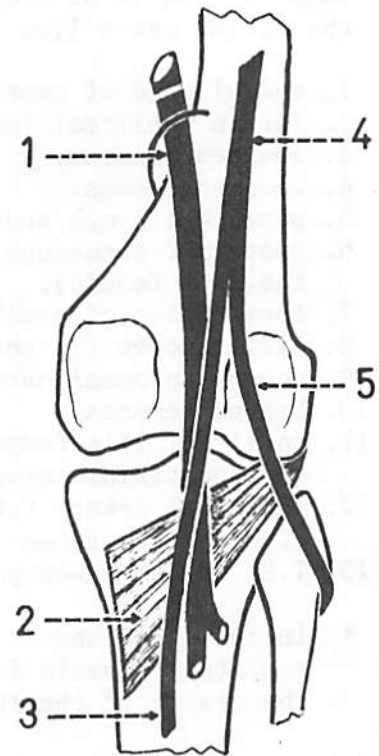


Fig.(189): MUSCLES SUPERFICIAL TO POPLITEAL ARTERY

The artery is overlapped by the semimembranosus (above) and by the plantaris and gastrocnemius (below).

1. semimembranosus.
2. medial head of gastrocnemius.
3. popliteal artery.
4. plantaris.
5. lateral head of gastrocnemius.

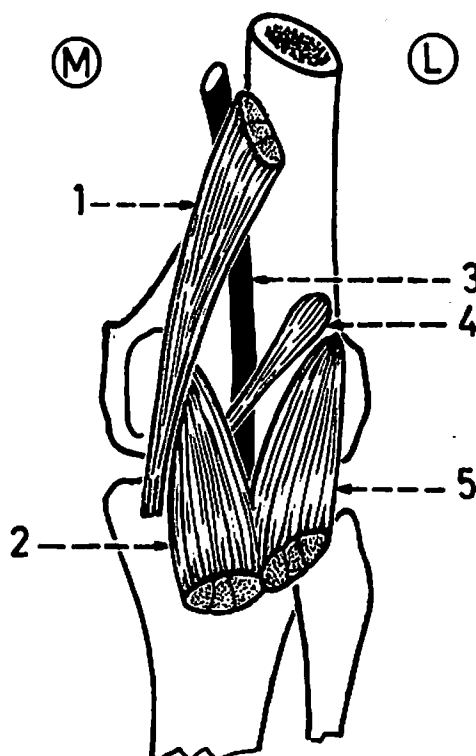


Fig.(190): OTHER STRUCTURES SUPERFICIAL TO POPLITEAL ARTERY

In the middle of the fossa the popliteal vein and tibial nerve are superficial to the artery.

1. popliteal artery.
2. popliteal vein.
3. tibial nerve.
4. popliteus.

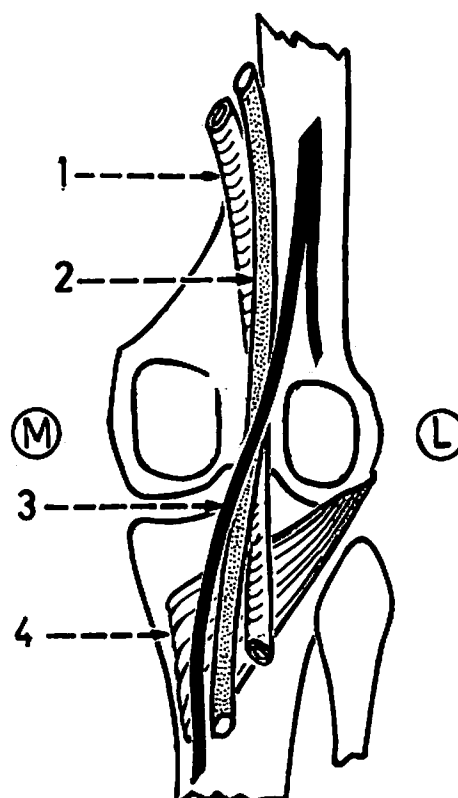


Fig.(191): GENICULAR BRANCHES
OF POPLITEAL ARTERY

The artery gives off 5 genicular branches: 2 superior, 2 inferior and 1 middle.

1. superior lateral genicular artery (above lateral condyle of femur).
2. inferior lateral genicular artery (below lateral condyle of tibia).
3. soleus.
4. popliteal artery.
5. superior medial genicular artery (above medial condyle of femur).
6. middle genicular artery (pierces the oblique popliteal ligament of knee joint).
7. inferior medial genicular artery (below medial condyle of tibia).
8. popliteus.
9. terminal divisions of popliteal artery.

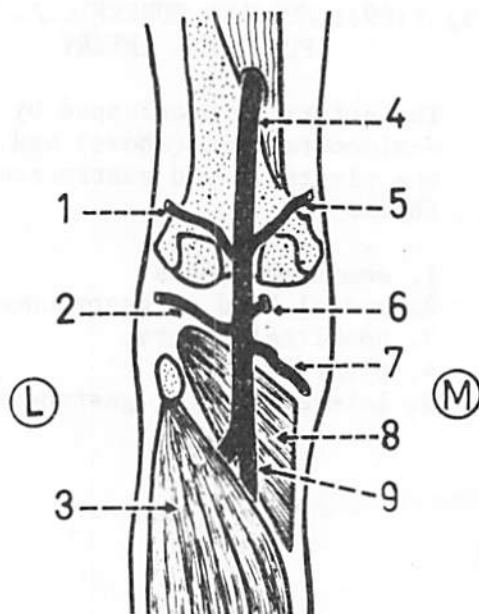
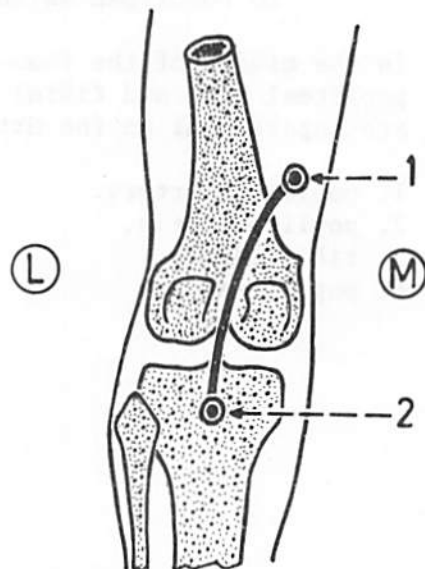


Fig.(192): SURFACE ANATOMY OF POPLITEAL ARTERY

It is represented by a line drawn between 2 points:

Point (1): on the medial side of thigh at the junction of its upper 2/3 and lower 1/3.

Point (2): at the middle of the upper part of the back of the leg at the level of the head of the fibula.



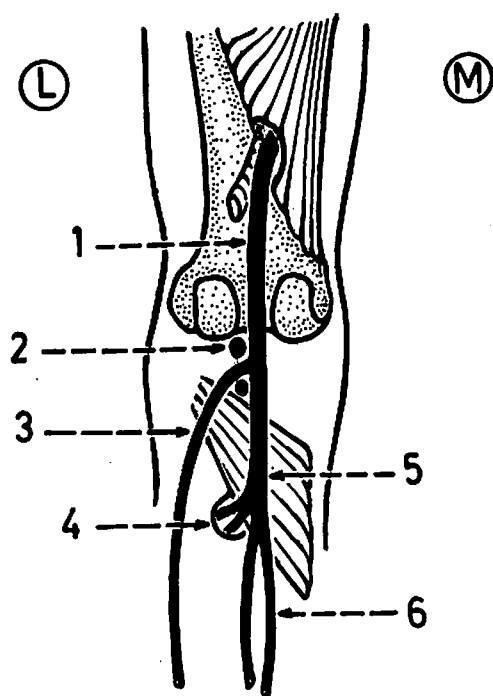
POPLITEAL VEIN

Fig.(193): COURSE AND TRIBUTARIES OF POPLITEAL VEIN

The popliteal vein begins at the lower border of popliteus by union of the venae comitantes of the anterior and posterior tibial arteries. It ends at the opening in the adductor magnus by becoming the femoral vein. The small saphenous vein is its main tributary.

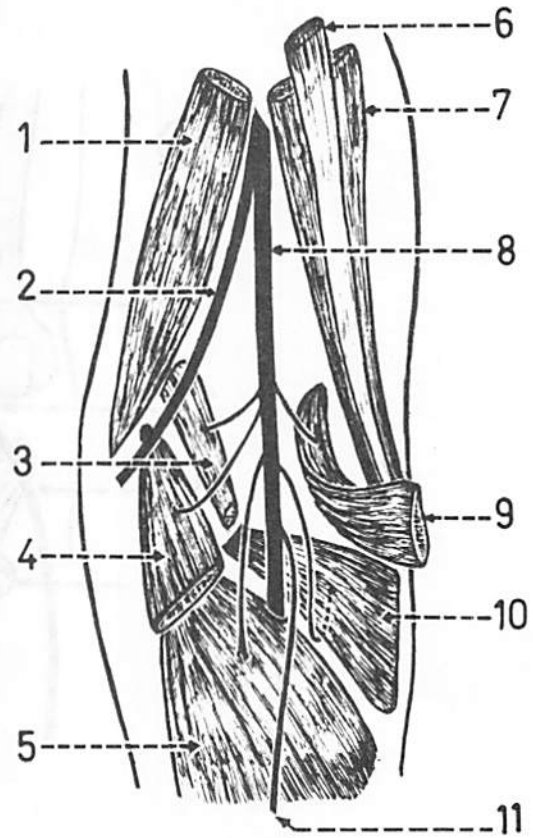
1. popliteal vein.
2. popliteal lymph nodes (at the termination of the small saphenous vein in the popliteal vein).
3. small saphenous vein (ends in the popliteal vein after piercing the fascial roof of the popliteal fossa).
4. venae comitantes of anterior tibial artery.
5. beginning of popliteal vein (at the lower border of popliteus).
6. venae comitantes of posterior tibial artery.

TIBIAL NERVE (MEDIAL POPLITEAL)Fig.(194): BRANCHES OF TIBIAL NERVE
IN THE POPLITEAL FOSSA

In the popliteal fossa the nerve gives off muscular branches (to gastrocnemius, plantaris, soleus and popliteus), a cutaneous branch (sural nerve) and articular branches to the knee joint.

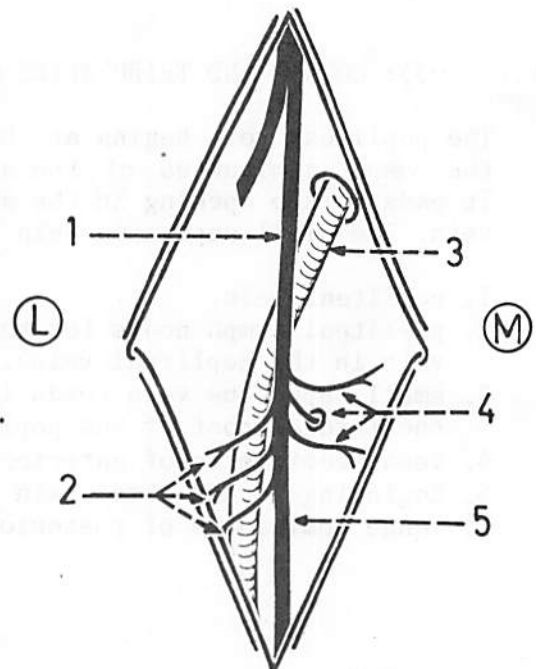
1. biceps femoris.
2. common peroneal nerve.
3. plantaris.
4. lateral head of gastrocnemius.
5. soleus.
6. semitendinosus.
7. semimembranosus.
8. tibial nerve.
9. medial head of gastrocnemius.
10. popliteus.
11. sural nerve.

- * Each head of the gastrocnemius has a separate branch.
- * The nerve to popliteus winds round its lower border to enter its deep surface.

Fig.(195): COURSE OF TIBIAL NERVE IN
THE POPLITEAL FOSSA

The nerve descends vertically in the midline of the fossa having triple relations to the popliteal artery where it is lateral to it above, crosses superficial to it in the middle of the fossa and comes medial to it below.

1. tibial nerve(lateral to the artery).
2. branches of tibial nerve crossing over the popliteal artery (muscular branches).
3. popliteal artery.
4. genicular branches (superior medial, middle, inferior medial).
5. tibial nerve(medial to the artery).



COMMON PERONEAL NERVE (LATERAL POPLITEAL)

Fig.(196): COMMON PERONEAL NERVE

It descends along the medial border of the biceps femoris where it crosses over the plantaris and lateral head of gastrocnemius, then over the back of the head of fibula. It gives off cutaneous branches (sural communicating and lateral cutaneous nerve of calf) and articular branches to the knee joint.

1. common peroneal nerve.
2. articular branch to knee joint.
3. recurrent genicular nerve (ascends to the knee joint).
4. end of common peroneal nerve (on lateral side of neck of fibula).
5. lateral cutaneous nerve of calf.
6. sural (peroneal) communicating.
7. sural nerve (from tibial nerve).

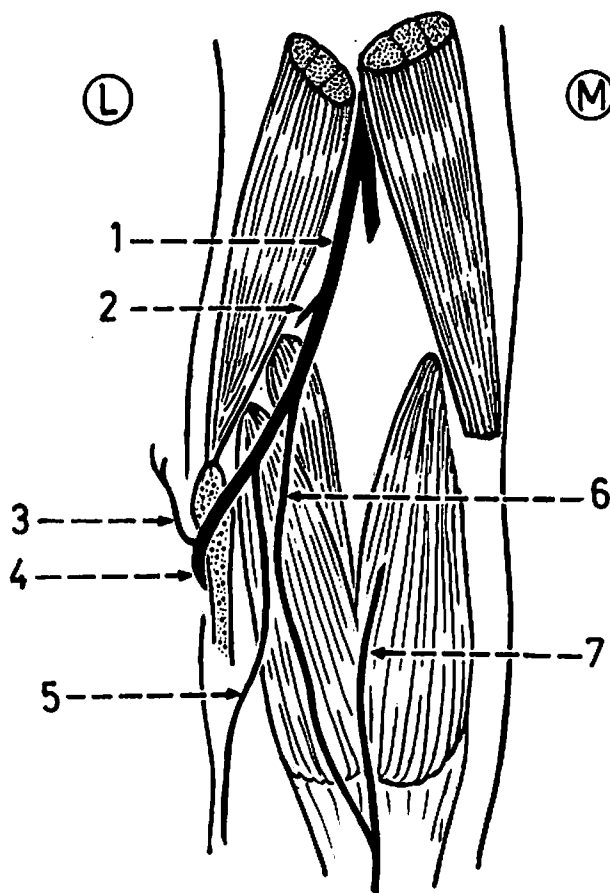
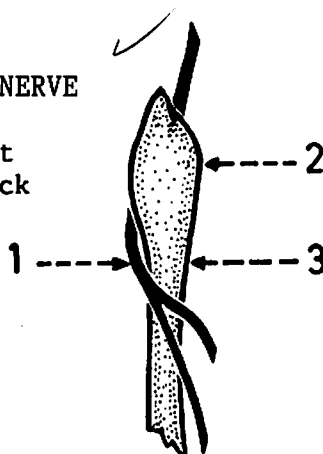


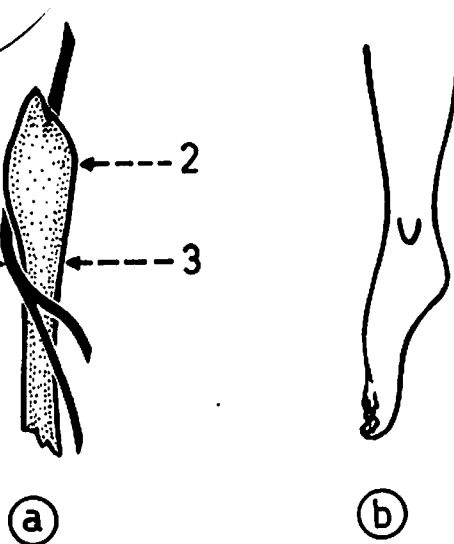
Fig.(197): INJURY OF COMMON PERONEAL NERVE

- (a) Common site for injury where it lies on the lateral side of neck of fibula

1. common peroneal nerve.
2. head of fibula.
3. neck of fibula.



- (b) Drop-foot: results from injury of the common peroneal nerve (the foot is plantar-flexed and inverted).



LEG

ANTERIOR AND LATERAL COMPARTMENTS OF THE LEG

Fig.(198): COMPARTMENTS OF THE LEG

1. deep fascia of leg.
2. anterior compartment.
3. anterior intermuscular septum.
4. lateral compartment.
5. transverse septum in the posterior compartment.
6. deep space of posterior compartment.
7. superficial space of posterior compartment.
8. fibula.
9. interosseous membrane.
10. tibia.

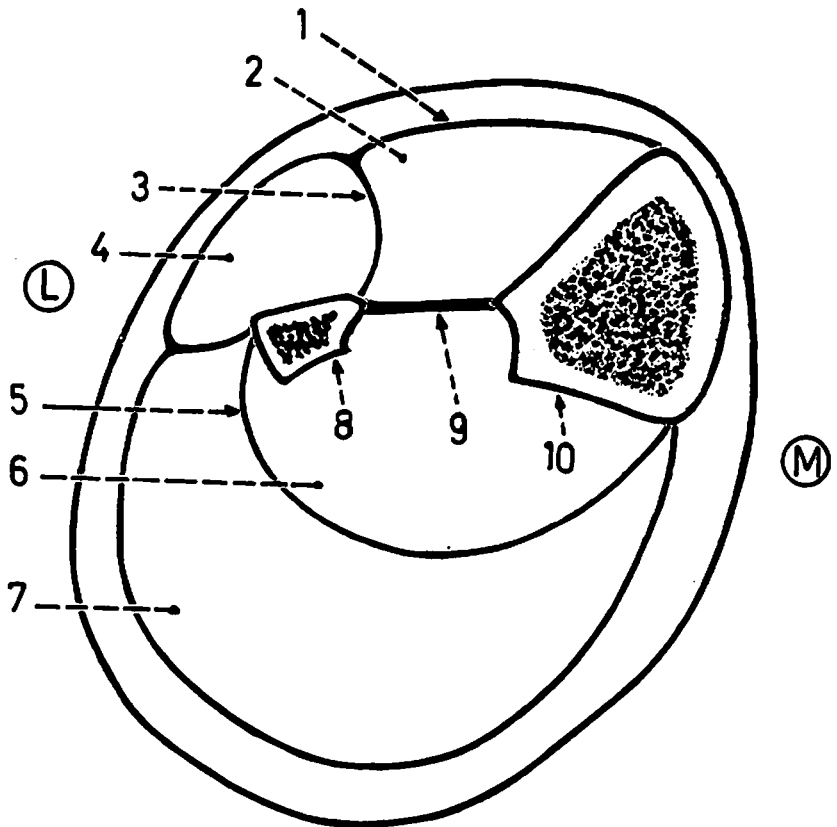
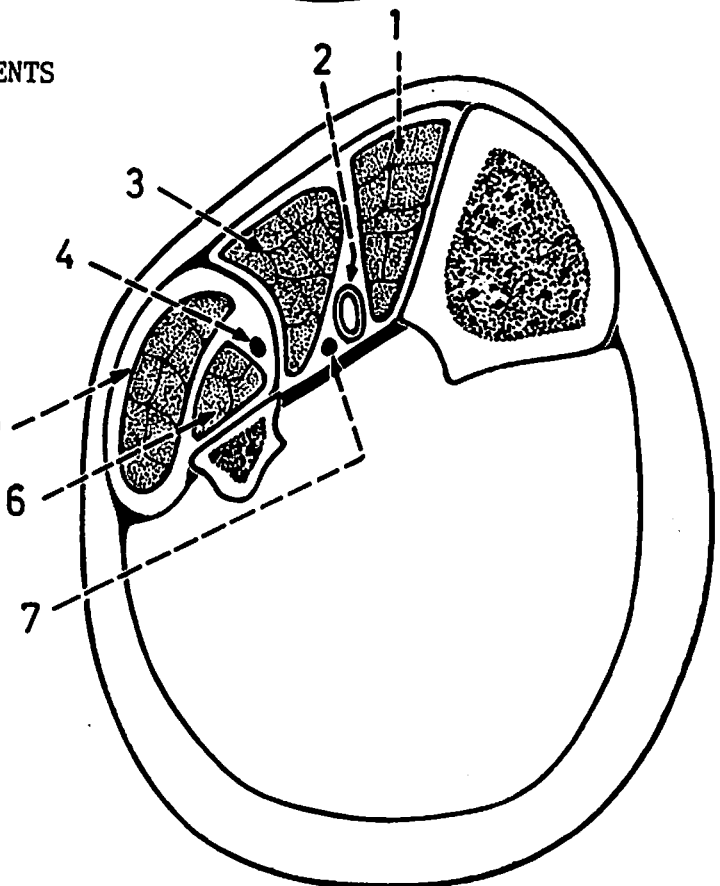


Fig.(199): CONTENTS OF ANTERIOR AND LATERAL COMPARTMENTS

1. tibialis anterior.
2. anterior tibial artery.
3. extensor muscles.
4. superficial peroneal nerve.
5. peroneus longus.
6. peroneus brevis.
7. deep peroneal nerve.

* The anterior compartment contains the extensor muscles in addition to the anterior tibial artery and deep peroneal nerve.

* The lateral compartment contains the peroneus longus and brevis and superficial peroneal nerve (no arteries).



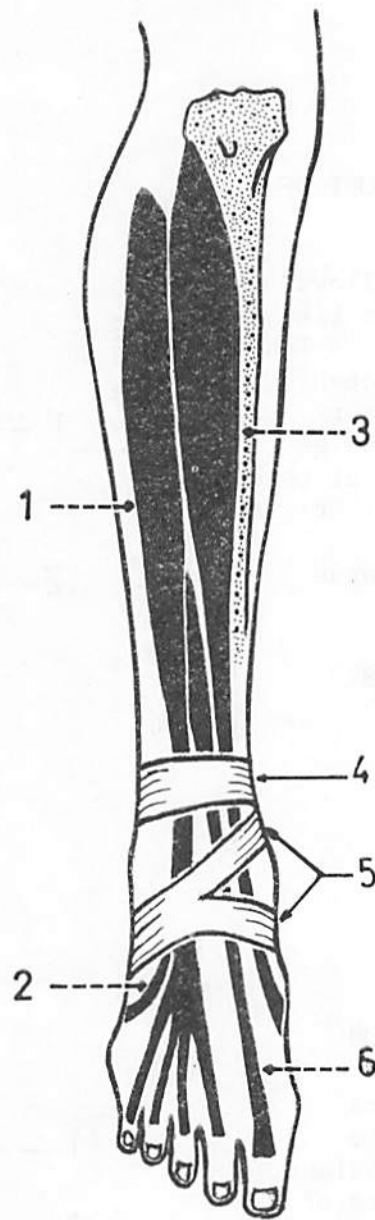


Fig.(200): MUSCLES IN THE ANTERIOR COMPARTMENT OF LEG

These are called extensor muscles and include: tibialis anterior, extensor digitorum longus, peroneus tertius and extensor hallucis longus.

1. extensor digitorum longus (from the upper 3/4 of anterior surface of fibula).
2. tendon of peroneus tertius (the muscle arises from the lower 1/4 of the anterior surface of fibula).
3. tibialis anterior (from the upper 1/2 of lateral surface of tibia).
4. superior extensor retinaculum.
5. Y-shaped inferior extensor retinaculum.
6. tendon of extensor hallucis longus (the muscle arises from the middle 2/4 of the anterior surface of fibula).

Fig.(201): STRUCTURES IN FRONT OF
THE ANKLE JOINT

These are arranged as follows
(from medial to lateral): tibialis
anterior, extensor hallucis longus,
anterior tibial artery, deep
peroneal nerve and extensor
digitorum longus. The muscles
can easily be identified at this
site rather than at their origins.

1. extensor digitorum longus.
2. deep peroneal nerve.
3. tibialis anterior.
4. extensor hallucis longus.
5. anterior tibial artery.

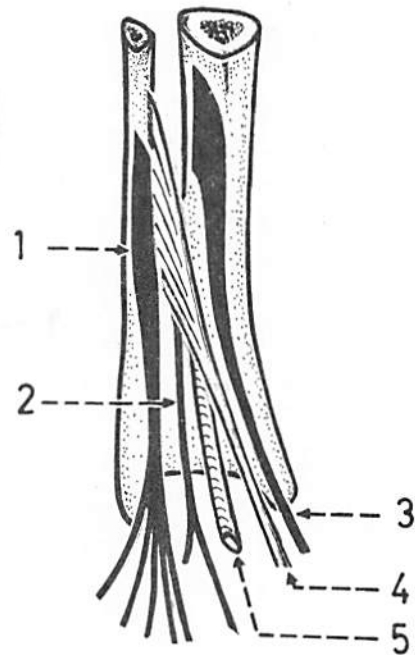


Fig.(202): EXTENSOR EXPANSION

It is a triangular fibrous
expansion which covers the
dorsum of the proximal phalanx.
It receives the insertions of
the extensor digitorum longus,
extensor digitorum brevis, 1
lumbrical and 2 interossei.
It is attached to the bases
of the middle and distal
phalanges.

1. collateral part of extensor
expansion (to the distal
phalanx).
2. central part of extensor
expansion (to middle phalanx).
3. extensor expansion.
4. interosseous muscle.
5. extensor digitorum longus.
6. lumbrical muscle.
7. interosseous muscle.
8. extensor digitorum brevis.

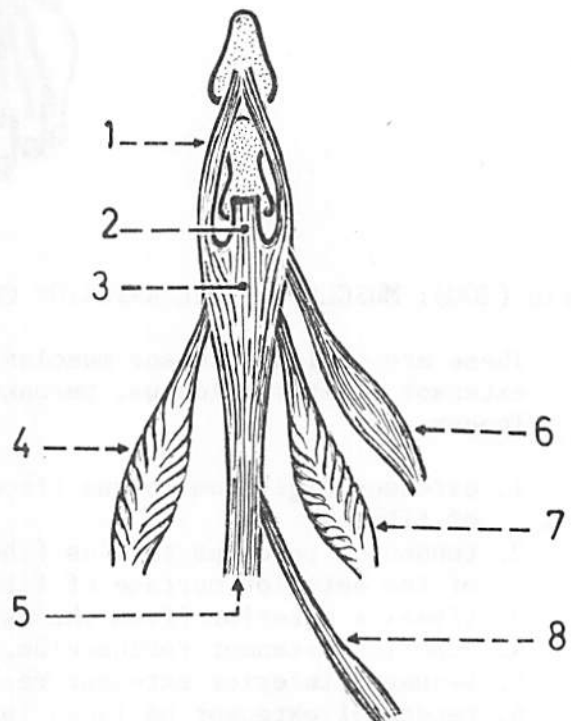


Fig.(203): ANTERIOR TIBIAL ARTERY

It is one of the terminal branches of popliteal artery which enters the anterior compartment medial to the neck of fibula. It descends in front of the interosseous membrane and ends in front of the ankle joint midway between the 2 malleoli..

1. deep peroneal nerve.
2. origin of extensor digitorum longus.
3. origin of extensor hallucis longus. (lateral to the artery).
4. lateral malleolar branch (to lateral malleolus).
5. anterior tibial recurrent branch (to the front of knee joint).
6. anterior tibial artery.
7. origin of tibialis anterior (medial to the artery).
8. interosseous membrane.
9. medial malleolar branch (to medial malleolus).
10. dorsalis pedis artery (continuation of anterior tibial artery).

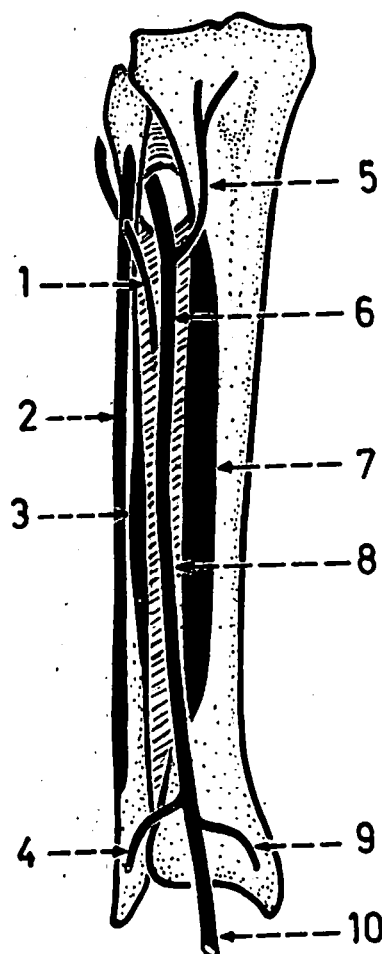
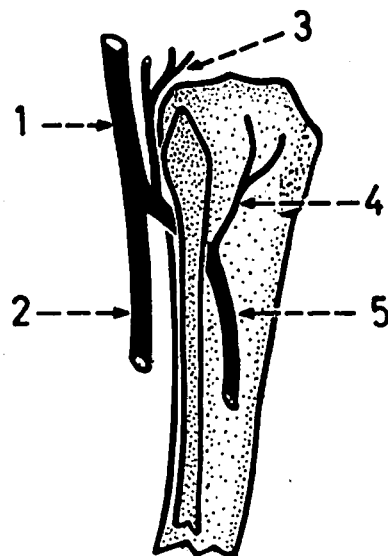


Fig.(204): ANTERIOR TIBIAL ARTERY
AT ITS BEGINNING

The artery has a short course in the back of the leg. It passes forwards through the interosseous membrane to enter the anterior compartment.

1. popliteal artery.
2. posterior tibial artery.
3. posterior tibial recurrent (arises from the artery in the back of the leg and ascends to the back of knee joint).
4. anterior tibial recurrent (arises from the artery in the anterior compartment and ascends to the front of knee joint).
5. anterior tibial artery (in the anterior compartment).



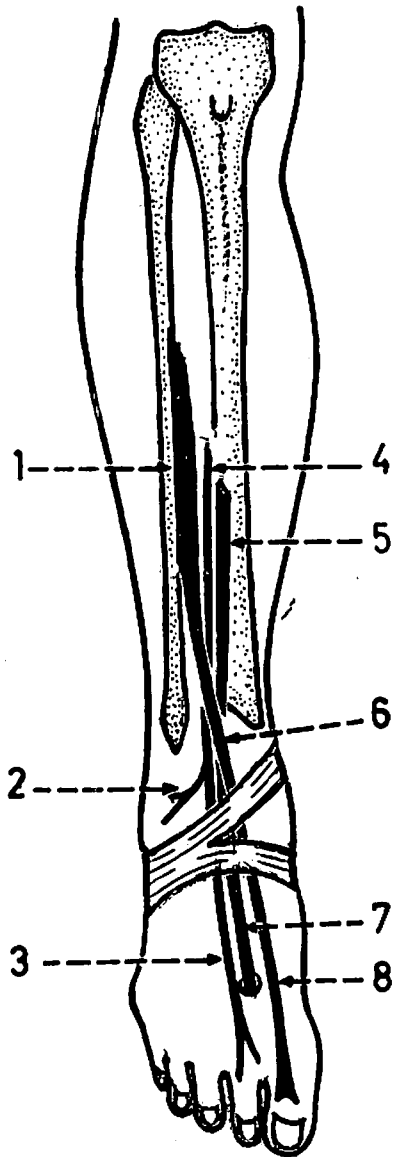


Fig.(205): RELATION OF ANTERIOR TIBIAL ARTERY TO EXTENSOR HALLUCIS LONGUS

The muscle is at 1st lateral to the artery, crosses in front of it then it comes medial.

1. extensor hallucis longus (lateral).
2. lateral division of deep peroneal nerve.
3. medial division of deep peroneal nerve.
4. deep peroneal nerve.
5. anterior tibial artery.
6. extensor hallucis longus (crossing in front of the artery).
7. dorsalis pedis artery.
8. extensor hallucis longus (medial).

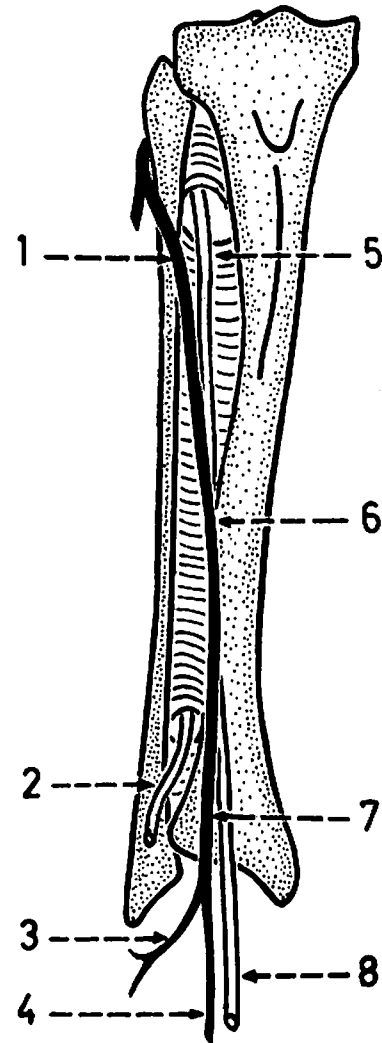


Fig.(206): RELATION OF ANTERIOR TIBIAL ARTERY TO DEEP PERONEAL NERVE

The nerve is at 1st lateral to the artery, comes in front of it then lateral again below.

1. deep peroneal nerve (lateral).
2. perforating branch of peroneal artery.
3. lateral division of deep peroneal nerve.
4. medial division of deep peroneal nerve.
5. anterior tibial artery.
6. deep peroneal nerve (in front).
7. deep peroneal nerve (lateral).
8. dorsalis pedis artery.

Fig.(207): MUSCLES IN THE LATERAL COMPARTMENT OF LEG

These are 2 muscles only: peroneus longus and peroneus brevis.

1. peroneus longus (the longer and superficial; arises from the upper 2/3 of lateral surface of fibula).
2. peroneus brevis (the shorter and deep; arises from the lower 2/3 of lateral surface of fibula).
3. peroneus tertius (lies in the anterior compartment).

* The peroneus longus and brevis are supplied by the superficial peroneal nerve (nerve of lateral compartment), while the peroneus tertius is supplied by the deep peroneal nerve (nerve of anterior compartment).

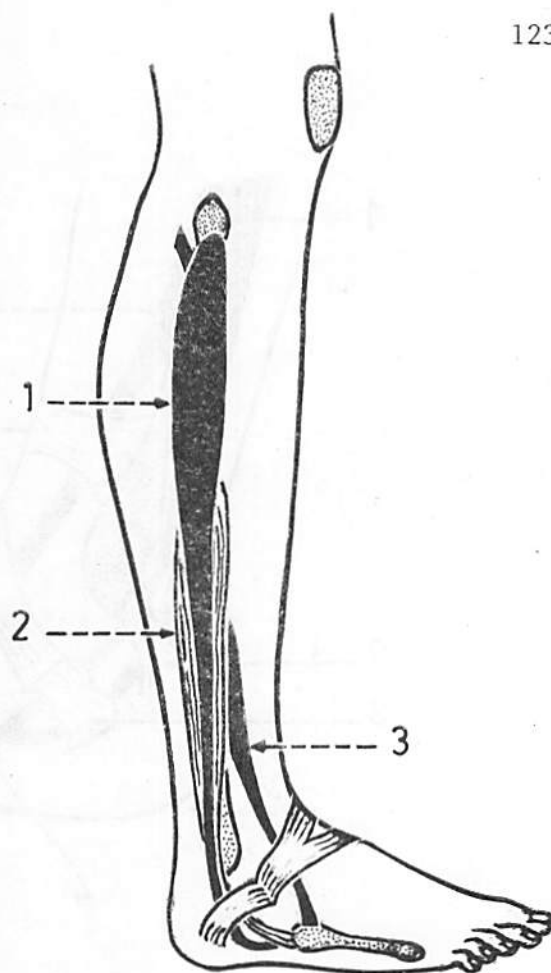
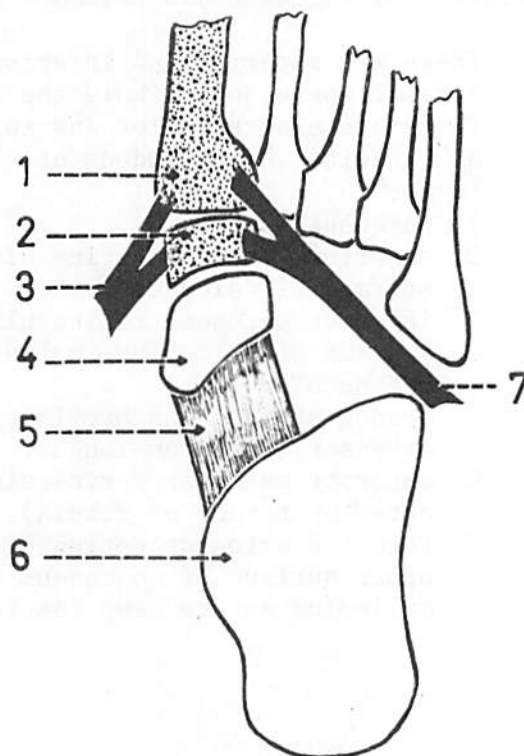


Fig.(208): INSERTION OF PERONEUS LONGUS

The long tendon of peroneus longus runs in the 4th layer of the sole from lateral to medial. It is inserted into the medial cuneiform and base of 1st metatarsal (same insertion as tibialis anterior).

1. base of 1st metatarsal.
2. medial cuneiform bone.
3. insertion of tibialis anterior.
4. navicular bone.
5. spring ligament.
6. calcaneus.
7. tendon of peroneus longus.



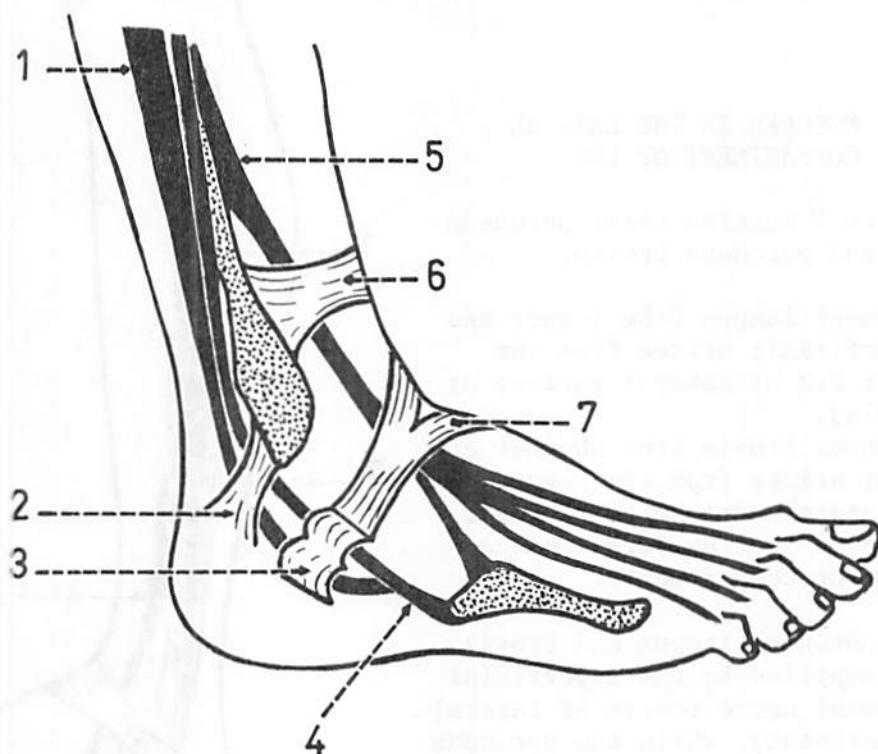


Fig.(209): PERONEAL AND EXTENSOR RETINACULA

There are superior and inferior peroneal retinacula on the lateral side of ankle joint (hold the tendons of peroneus longus and brevis). There are also superior and inferior extensor retinacula in front of ankle joint (hold tendons of extensor muscles).

1. peroneus longus.
2. superior peroneal retinaculum (from lateral malleolus to lateral surface of calcaneus).
3. inferior peroneal retinaculum (attached by its 2 ends to lateral surface of calcaneus in line with the stem of inferior extensor retinaculum).
4. tendon of peroneus brevis (inserted into the base of 5th metatarsal).
5. extensor digitorum longus.
6. superior extensor retinaculum (from anterior border of tibia to anterior border of fibula).
7. inferior extensor retinaculum (Y-shaped with its stem attached to upper surface of calcaneus and its 2 limbs attached to medial malleolus and to deep fascia on the medial side of foot).

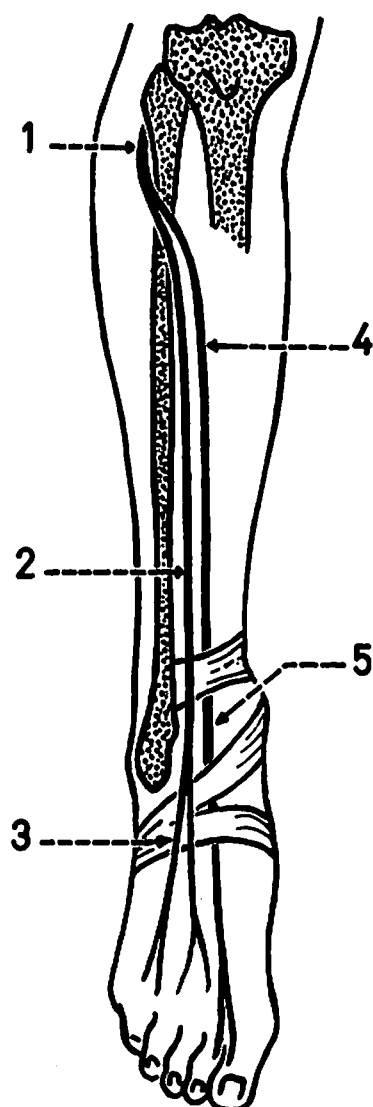
SUPERFICIAL AND DEEP PERONEAL NERVES

Fig.(210): SUPERFICIAL AND DEEP PERONEAL NERVES

1. common peroneal nerve (divides into superficial and deep peroneal nerves).
2. superficial peroneal nerve (in lateral compartment of the leg).
3. termination of superficial peroneal nerve (superficial to the extensor retinacula).
4. deep peroneal nerve (in anterior compartment of the leg).
5. deep peroneal nerve (deep to the extensor retinacula).

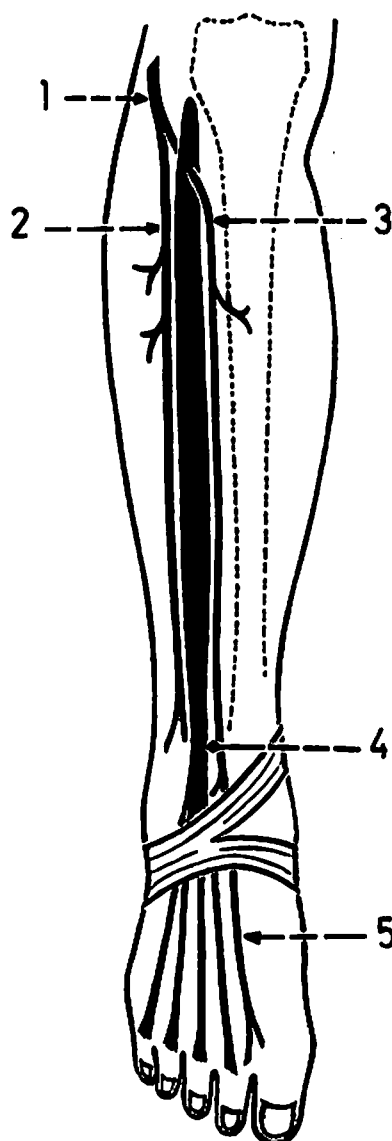


Fig.(211): RELATIONS OF SUPERFICIAL AND DEEP PERONEAL NERVES TO EXTENSOR DIGITORUM LONGUS

1. common peroneal nerve.
2. superficial peroneal nerve (descends lateral to the extensor digitorum longus).
3. deep peroneal nerve (pierces the extensor digitorum longus and descends medial to it).
4. extensor digitorum longus.
5. termination of deep peroneal nerve.

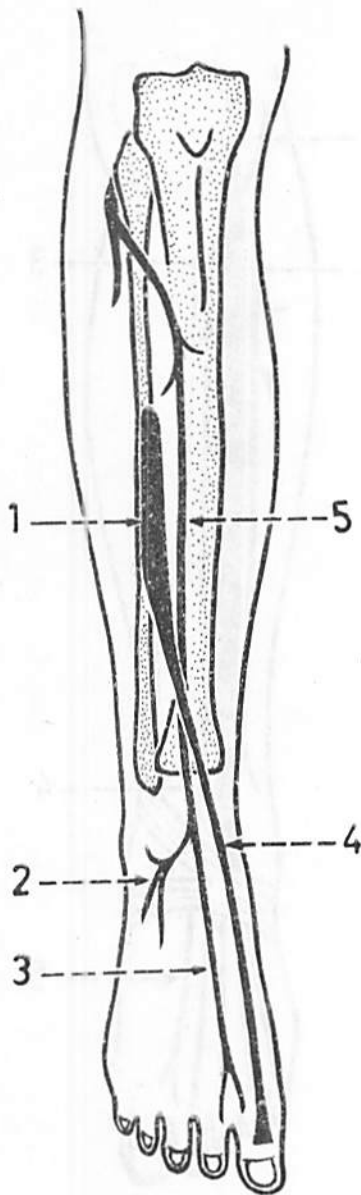


Fig.(212): RELATIONS OF DEEP PERONEAL NERVE TO EXTENSOR HALLUCIS LONGUS

The muscle is at 1st lateral to the nerve, crosses in front of it to come medial.

1. extensor hallucis longus.
2. lateral division of deep peroneal nerve.
3. medial division of the nerve.
4. tendon of extensor hallucis longus (medial to the nerve).
5. deep peroneal nerve (medial to the muscle).

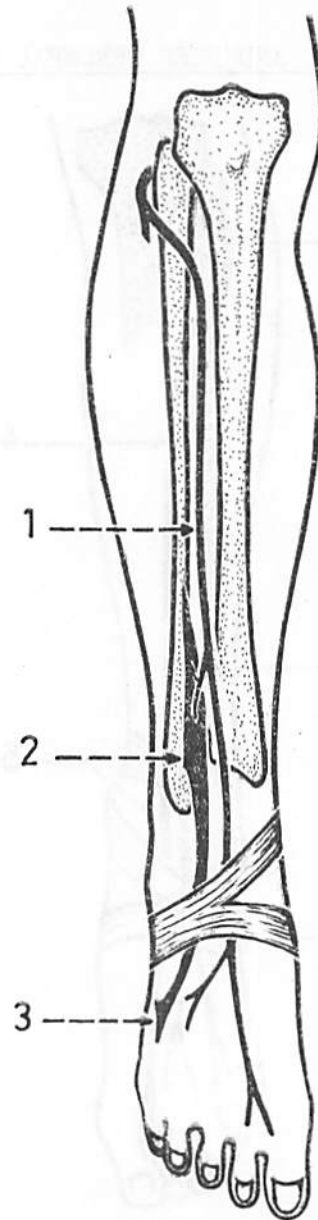


Fig.(213): NERVE SUPPLY TO PERONEUS TERTIUS

The peroneus tertius gets its nerve supply from the deep peroneal nerve.

1. deep peroneal nerve.
2. origin of peroneus tertius (from lower 1/4 of anterior surface of fibula).
3. insertion of peroneus tertius (into the base of 5th metatarsal bone).

Fig.(214): BRANCHES OF DEEP PERONEAL NERVE

It gives off muscular branches to 4 muscles (tibialis anterior, extensor digitorum longus, extensor hallucis longus and peroneus tertius), articular branches to the ankle joint and 2 terminal divisions (lateral and medial).

1. common peroneal nerve.
 2. deep peroneal nerve (between tibialis anterior and extensor digitorum longus).
 3. extensor digitorum longus.
 4. termination of deep peroneal nerve (between extensor hallucis longus and extensor digitorum longus).
 5. lateral division of the nerve (supplies the extensor digitorum brevis).
 6. tendon of peroneus tertius.
 7. tibialis anterior.
 8. deep peroneal nerve (between tibialis anterior and extensor hallucis longus).
 9. medial division of the nerve (lateral and parallel to the tendon of extensor hallucis longus).
 10. tendon of extensor hallucis longus.
- * Note that the deep peroneal nerve lies at 1st between tibialis anterior and extensor digitorum longus then between tibialis anterior and extensor hallucis longus. In front of the ankle joint it lies between the extensor hallucis longus and extensor digitorum longus.

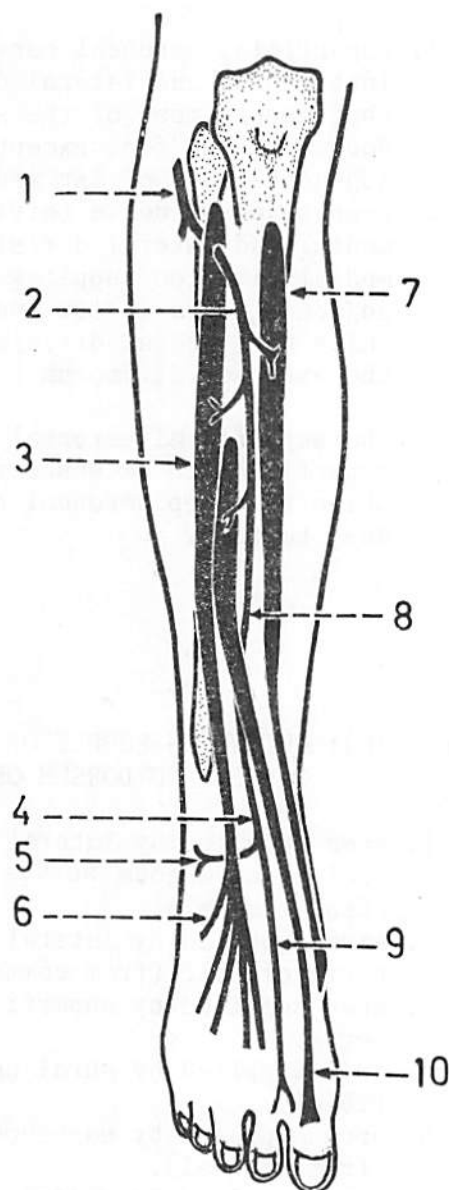


Fig.(215): TERMINATION OF PERONEAL NERVES
ON THE DORSUM OF THE FOOT

1. superficial peroneal nerve (divides into medial and lateral divisions that supply most of the skin of the dorsum of the foot except the adjacent sides of 1st and 2nd toes).
2. deep peroneal nerve (divides into medial and lateral divisions; the medial division supplies the adjacent sides of 1st and 2nd toes while the lateral division supplies the extensor digitorum brevis).

* The superficial peroneal nerve is superficial to extensor retinacula, while the deep peroneal nerve is deep to them.

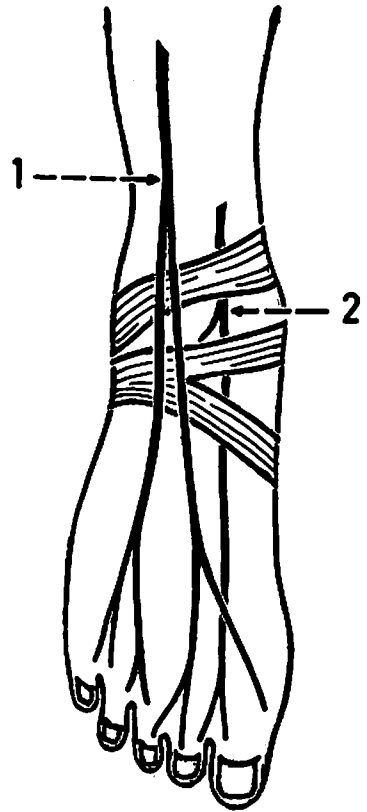
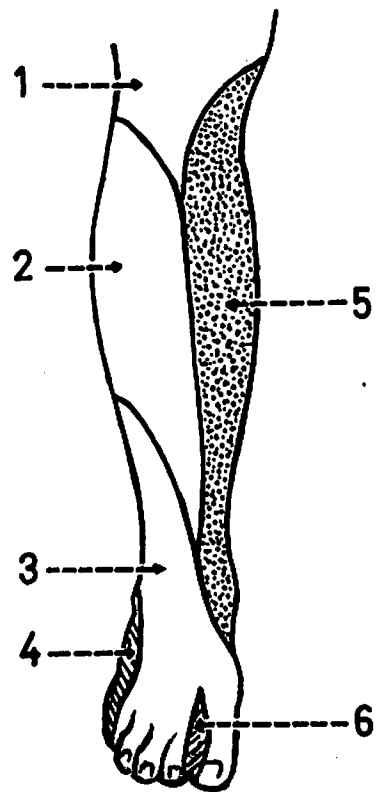


Fig.(216): CUTANEOUS SUPPLY OF FRONT
OF LEG AND DORSUM OF FOOT

1. area supplied by lateral and intermediate cutaneous nerves of thigh (from femoral).
2. area supplied by lateral cutaneous nerve of calf (from common peroneal).
3. area supplied by superficial peroneal nerve.
4. area supplied by sural nerve (from tibial).
5. area supplied by saphenous nerve (from femoral).
6. area supplied by medial division of deep peroneal nerve.

* The skin of the front of leg and dorsum of foot is supplied mainly by branches from the common peroneal and femoral nerves.



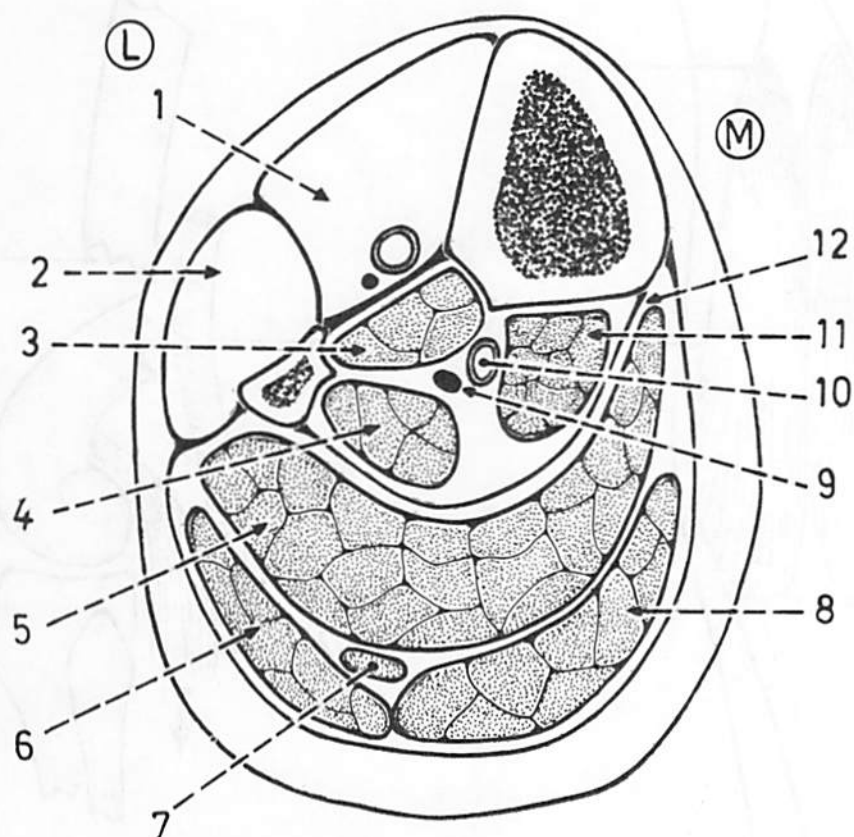
POSTERIOR COMPARTMENT OF THE LEG

Fig.(217): POSTERIOR COMPARTMENT OF THE LEG IN CROSS-SECTION

The posterior compartment of the leg lies behind the interosseous membrane and both bones of the leg. It is subdivided into a deep space which contains the deep group of muscles (popliteus, flexor digitorum longus, flexor hallucis longus and tibialis posterior) and a superficial space which contains the superficial group of muscles (gastrocnemius, plantaris and soleus). the posterior compartment also contains the posterior tibial vessels and tibial nerve which descend vertically between the 2 groups of muscles.

- | | |
|--|---------------------------------------|
| 1. anterior compartment (contains anterior tibial artery and deep peroneal nerve). | 7. plantaris. |
| 2. lateral compartment. | 8. medial head of gastrocnemius. |
| 3. tibialis posterior (immediately behind interosseous membrane). | 9. tibial nerve. |
| 4. flexor hallucis longus. | 10. posterior tibial artery. |
| 5. soleus. | 11. flexor digitorum longus. |
| 6. lateral head of gastrocnemius. | 12. transverse septum of deep fascia. |

* The tibial nerve and posterior tibial artery are separated from the interosseous membrane by the tibialis posterior muscle.



Fig.(218): GASTROCNEMIUS MUSCLE

It is the most superficial muscle of the calf and has 2 heads (medial and lateral).

1. plantaris.
2. fleshy belly of gastrocnemius.
3. tendo-calcaneus.
4. lateral malleolus.

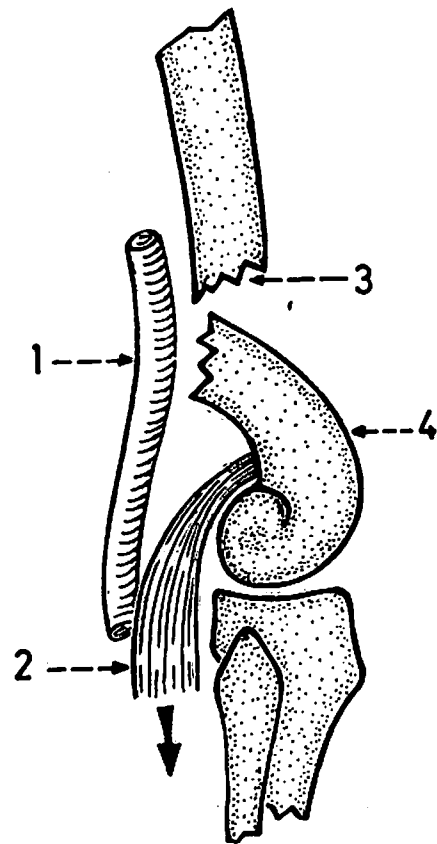


Fig.(219): ACTION OF GASTROCNEMIUS IN SUPRACONDYLAR FRACTURE OF FEMUR

In supracondylar fracture the gastrocnemius draws the distal fragment of bone backwards (flexes it) thus exposing the popliteal artery to injury.

1. popliteal artery.
2. gastrocnemius.
3. supracondylar fracture.
4. distal segment of femur (flexed).

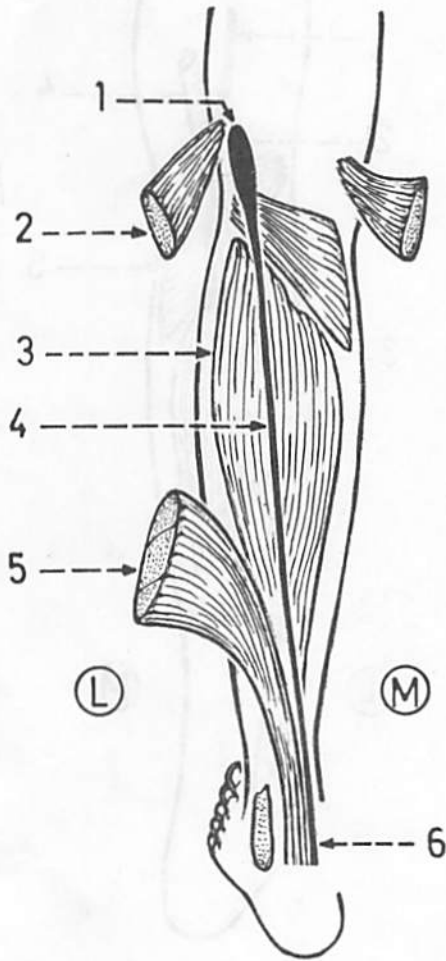


Fig.(220): SUPERFICIAL MUSCLES OF THE CALF

These muscles include the gastrocnemius, soleus and plantaris.

1. fleshy belly of plantaris.
2. lateral head of gastrocnemius.
3. soleus (deep to gastrocnemius).
4. long tendon of plantaris.
5. gastrocnemius (cut).
6. tendo-calcaneus together with the tendon of plantaris (inserted into the back of calcaneus).

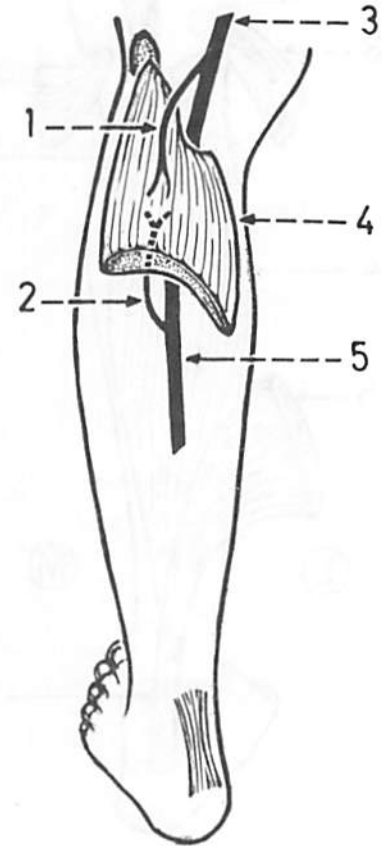


fig.(221): NERVE SUPPLY OF SOLEUS

The soleus gets 2 branches from the tibial nerve: one branch arises in the popliteal fossa and enters the superficial surface of the muscle, while the other arises in the leg and enters the deep surface of the muscle.

1. branch arising in the popliteal fossa (to superficial surface).
2. branch arising in the back of the leg (to deep surface).
3. tibial nerve (in popliteal fossa).
4. soleus.
5. tibial nerve (in back of leg).

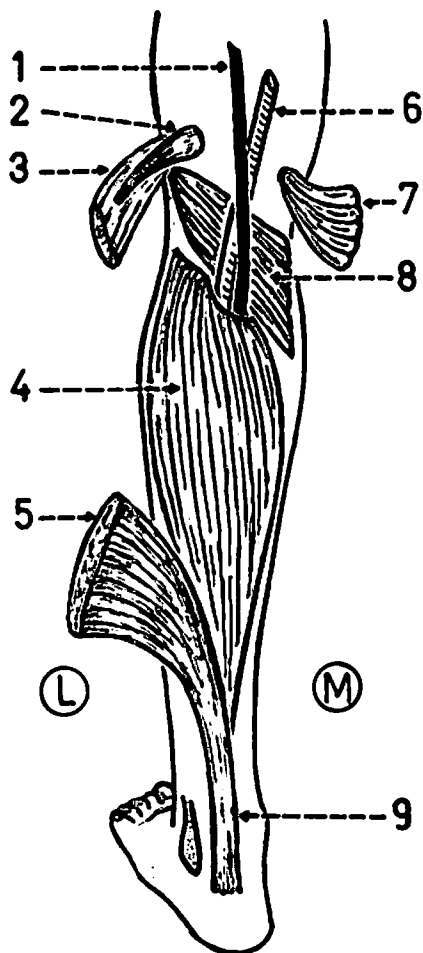


Fig.(222): POPLITEUS AND SOLEUS MUSCLES

The popliteus lies just above the soleus and both of them are covered by the plantaris and gastrocnemius.

1. tibial nerve.
2. plantaris (cut).
3. lateral head of gastrocnemius.
4. soleus (lies edge to edge with the popliteus).
5. gastrocnemius (cut).
6. popliteal artery.
7. medial head of gastrocnemius.
8. popliteus (its fibres run downwards and medially deep to tibial nerve and popliteal vessels).
9. tendo-calcaneus.

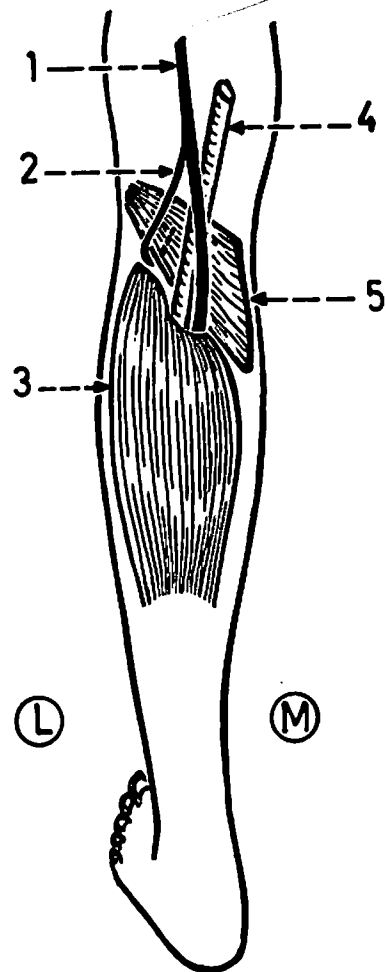


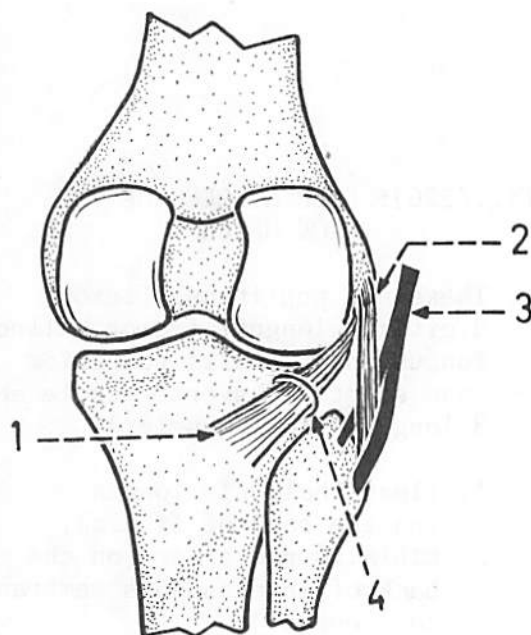
Fig.(223): NERVE SUPPLY OF POPLITEUS

The muscle gets a branch from the tibial nerve in the popliteal fossa. This branch descends on the superficial surface of the muscle and winds round its lower border to sink in its deep surface.

1. tibial nerve in popliteal fossa.
2. branch to popliteus.
3. soleus.
4. popliteal artery.
5. popliteus.

Fig.(224): RELATIONS OF THE ORIGIN
OF THE POPLITEUS

The muscle arises from the groove for popliteus situated just below the lateral epicondyle of femur. Its origin is intracapsular and is related superficially to the capsule of knee joint, fibular collateral ligament and tendon of biceps femoris.



1. tendon of popliteus (as it emerges from the back of knee joint under cover of the arcuate popliteal ligament).
2. fibular collateral ligament.
3. tendon of biceps femoris.
4. arcuate popliteal ligament.

Fig.(225): POSTERIOR SURFACES OF
TIBIA AND FIBULA

1. medial area of posterior surface of tibia (for flexor digitorum longus).
2. vertical ridge on the back of tibia.
3. lateral area of posterior surface of tibia (for tibialis posterior).
4. medial area of posterior surface of fibula (for tibialis posterior).
5. posterior compartment of leg.
6. medial crest (of fibula).
7. lateral area of posterior surface of fibula (for flexor hallucis longus).
8. lateral compartment of leg.
9. anterior compartment of leg.

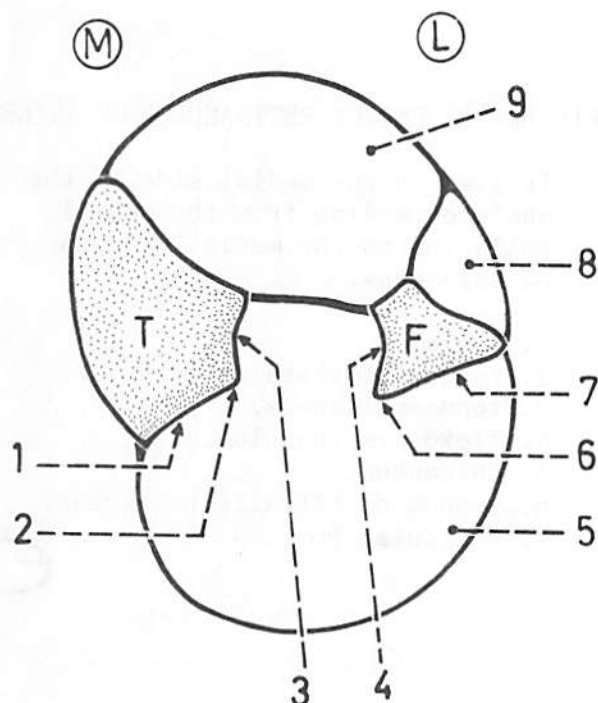


Fig.(226): DEEP MUSCLES OF THE
BACK OF LEG

These are popliteus, flexor digitorum longus, flexor hallucis longus and tibialis posterior (one short transverse muscle and 3 long vertical muscles).

1. flexor hallucis longus (on the back of fibula).
2. tibialis posterior (on the back of interosseous membrane, the deepest).
3. popliteus (short and transverse).
4. soleus.
5. flexor digitorum longus (on the back of tibia).
6. tendon of flexor digitorum longus crossing over the tendon of tibialis posterior.

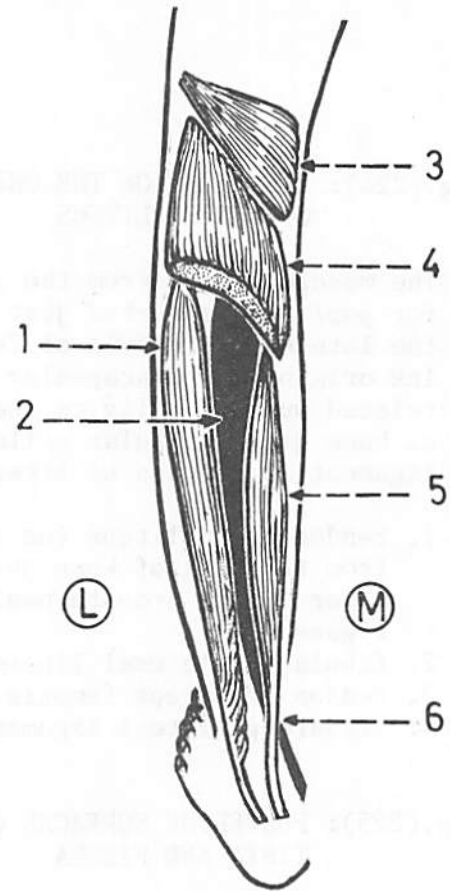


Fig.(227): FLEXOR RETINACULUM OF ANKLE

It lies on the medial side of the ankle extending from the medial malleolus to the medial process of calcaneus.

1. tibia.
2. tendon of tibialis anterior.
3. tendo-calcaneus.
4. flexor retinaculum.
5. calcaneus.
6. tendon of tibialis posterior.
7. navicular bone.

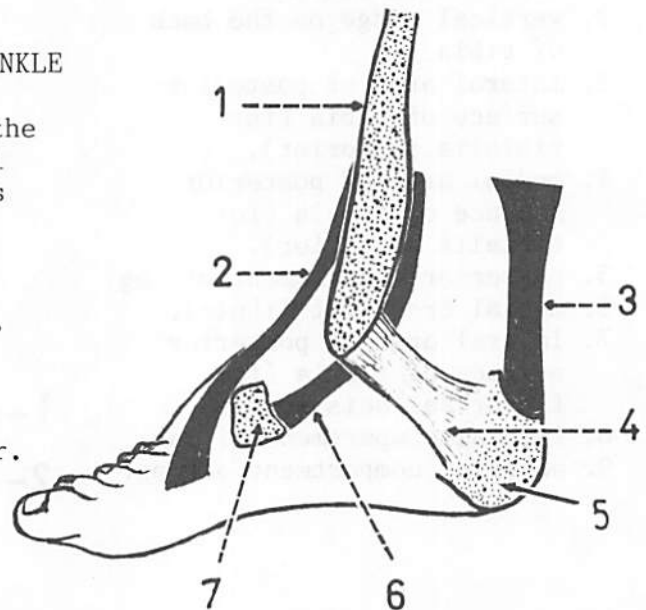


Fig.(228): FLEXOR RETINACULUM
OVERLYING THE TERMINATION
OF POSTERIOR TIBIAL ARTERY

1. tibia.
2. terminal divisions of posterior tibial artery.
3. posterior tibial artery.
4. flexor retinaculum.
5. calcanean branch of posterior tibial artery (to the heel).

* Other structures passing under cover of the flexor retinaculum are illustrated in fig.(229).

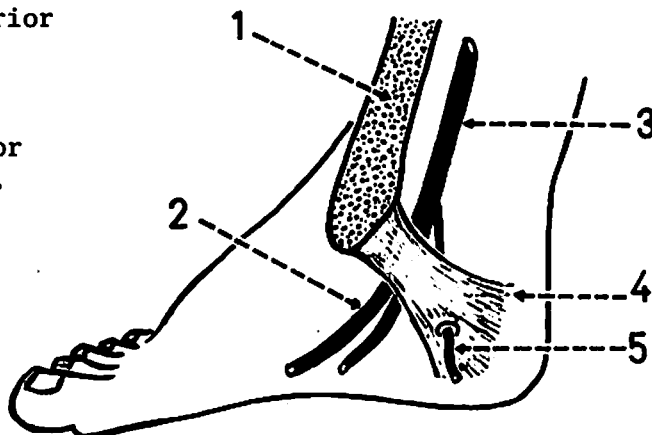


Fig.(229): STRUCTURES UNDER COVER
OF FLEXOR RETINACULUM

These structures are arranged as follows (from medial to lateral):
tendon of tibialis posterior,
tendon of flexor digitorum longus,
posterior tibial vessels, tibial
nerve, tendon of flexor hallucis
longus.

1. tibialis posterior (most medial).
2. flexor digitorum longus.
3. posterior tibial artery.
4. tibial nerve.
5. flexor hallucis longus (most lateral).
6. tendo-calcaneus.

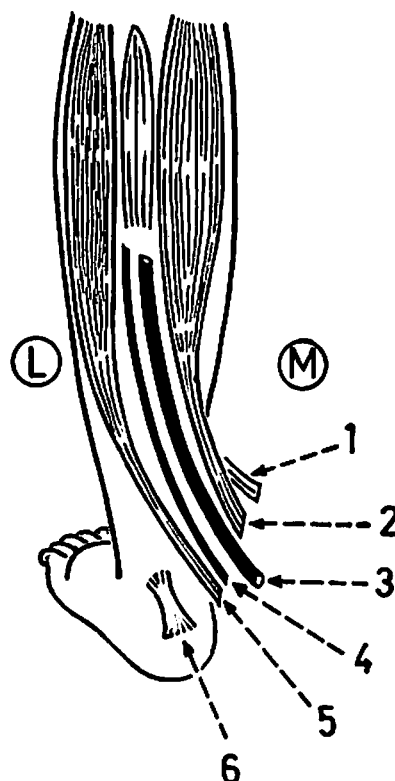


Fig.(230): TENDONS OF FLEXOR HALLUCIS LONGUS AND FLEXOR DIGITORUM LONGUS IN THE SOLE

1. tendon of flexor hallucis longus (inserted into the base of terminal phalanx of the hallux).
2. tendon of flexor digitorum longus (crosses superficial to the tendon of flexor hallucis longus and then divides into 4 tendons to the lateral 4 toes).

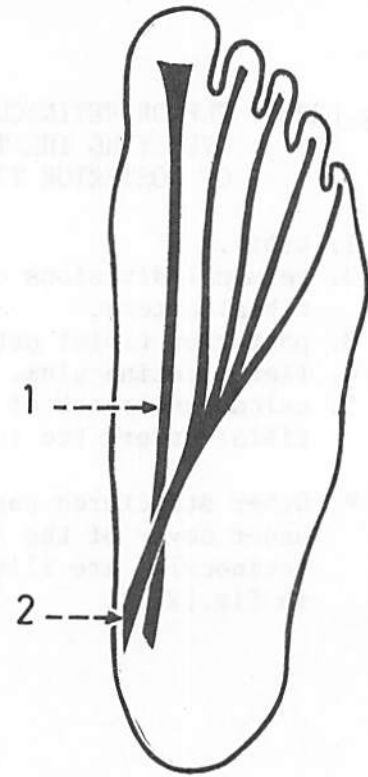


Fig.(231): MUSCLES ATTACHED TO THE TENDON OF FLEXOR DIGITORUM LONGUS IN THE SOLE

In the sole the tendon of flexor digitorum longus receives the insertion of flexor accessorius muscle and gives origin to the 4 lumbricals.

1. lumbrical muscle.
2. tendon of flexor digitorum longus.
3. flexor accessorius muscle.
4. calcaneus.

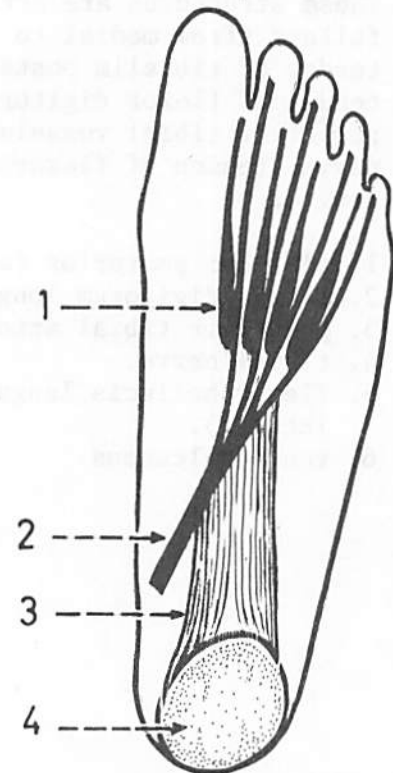


Fig.(232): TENDONS OF INSERTION OF
TIBIALIS ANTERIOR,
TIBIALIS POSTERIOR AND
FLEXOR HALLUCIS LONGUS

1. tibialis anterior (inserted into the medial cuneiform and base of 1st metatarsal).
 2. tibialis posterior (inserted into the tuberosity of navicular bone and other tarsal bones except the talus).
 3. flexor hallucis longus (inserted into the base of terminal phalanx of the big toe).
- * Note that the tibia lies between the tibialis anterior in front and the tibialis posterior behind.

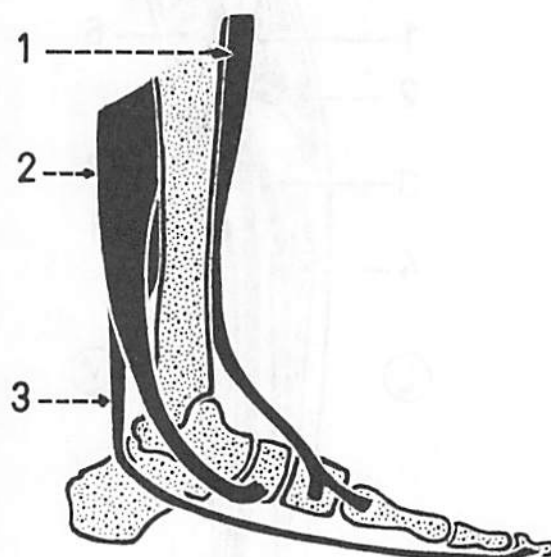
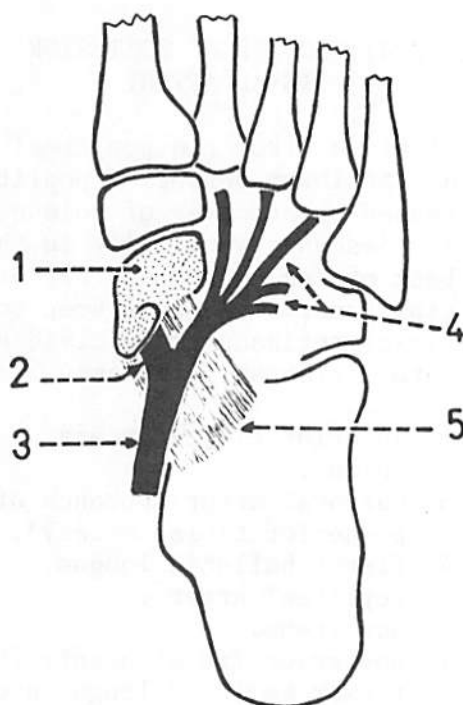


Fig.(233): INSERTION OF TIBIALIS
POSTERIOR

In the sole the tendon lies below the plantar calcaneo-navicular (spring) ligament. It is inserted mainly into the tuberosity of navicular bone and by slips into the bases of 2nd, 3rd and 4th metatarsals as well as into all tarsal bones except the talus.

1. navicular bone.
2. part inserted into tuberosity of navicular bone.
3. tendon of tibialis posterior.
4. slips of insertion into other tarsal bones (except the talus).
5. plantar calcaneo-navicular (spring) ligament.



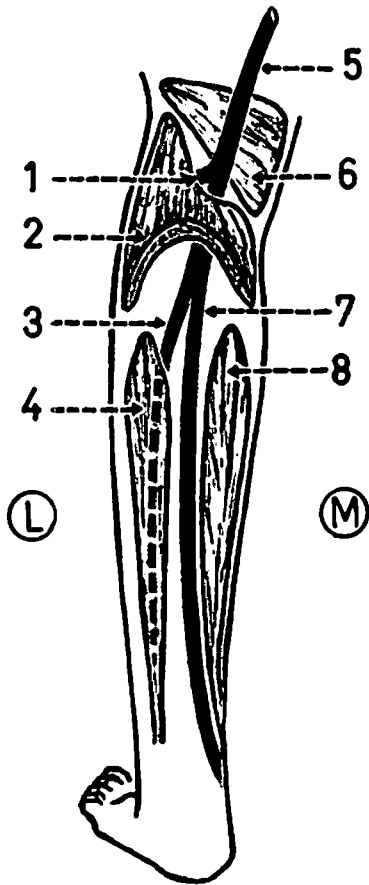
POSTERIOR TIBIAL ARTERY

Fig.(234): COURSE OF POSTERIOR TIBIAL ARTERY

It arises from the popliteal artery at the lower border of popliteus, passes under cover of soleus muscle and descends vertically in the back of leg in company with the tibial nerve. It ends deep to the flexor retinaculum by dividing into 2 plantar arteries.

1. anterior tibial artery.
2. soleus.
3. peroneal artery (branch of posterior tibial artery).
4. flexor hallucis longus.
5. popliteal artery.
6. popliteus.
7. posterior tibial. artery (between flexor hallucis longus and flexor digitorum longus).
8. flexor digitorum longus.

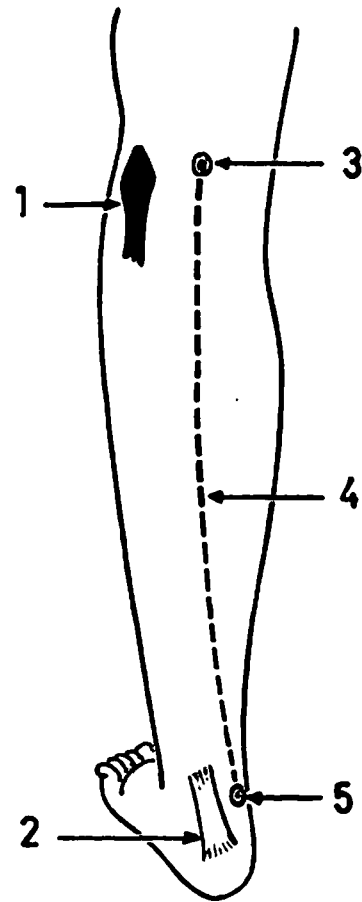


Fig.(235): SURFACE ANATOMY OF POSTERIOR TIBIAL ARTERY

It is represented by a line drawn on the back of the leg between 2 points:

upper point: in the midline of the back of leg at the level of the head of fibula.

lower point: midway between the medial malleolus and the heel.

1. head of fibula.
2. tendo-calcaneus.
3. upper point of the line.
4. line of surface anatomy of the posterior tibial artery.
5. lower point of the line.

Fig.(236): BRANCHES OF POSTERIOR TIBIAL ARTERY

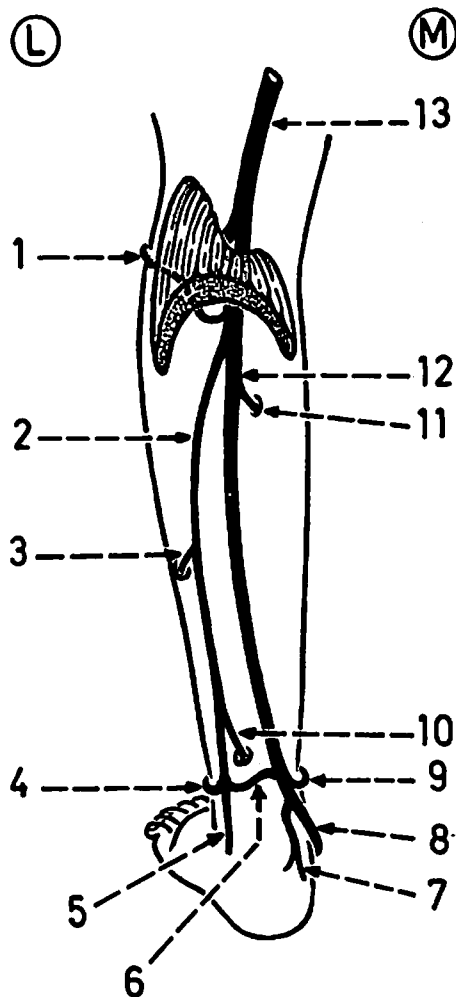
The posterior tibial artery gives off the following branches: peroneal, circumflex fibular, nutrient to tibia, communicating branch, medial malleolar, medial calcaneal and 2 terminal branches (medial and lateral plantar).

The peroneal artery arises from the posterior tibial 1 inch below its origin and gives off the following branches: nutrient to fibula, communicating branch, lateral malleolar, lateral calcaneal and perforating.

1. circumflex fibular artery (winds round the lateral aspect of the neck of fibula).
2. peroneal artery (the main branch, descends along the back of the fibula deep to the flexor hallucis longus).
3. nutrient branch to fibula (from peroneal).
4. lateral malleolar branch of peroneal (to lateral malleolus).
5. lateral calcaneal branch of peroneal (to lateral side of calcaneus).
6. communicating branch (between posterior tibial and peroneal).
7. medial calcaneal branch of posterior tibial (to medial side of calcaneus).
8. lower end of posterior tibial artery.
9. medial malleolar branch of posterior tibial (to medial malleolus).
10. perforating branch of peroneal (pierces the lower part of the interosseous membrane and descends on the front of the ankle joint).
11. nutrient branch to tibia (from posterior tibial).
12. posterior tibial artery.
13. popliteal artery.

* The posterior tibial artery and its peroneal branch share in the anastomoses around the knee joint and the ankle joint.

* The posterior tibial artery does not come in direct contact with bone, while the peroneal artery descends in direct contact with the fibula and thus it is exposed to injury in fracture of the fibula.



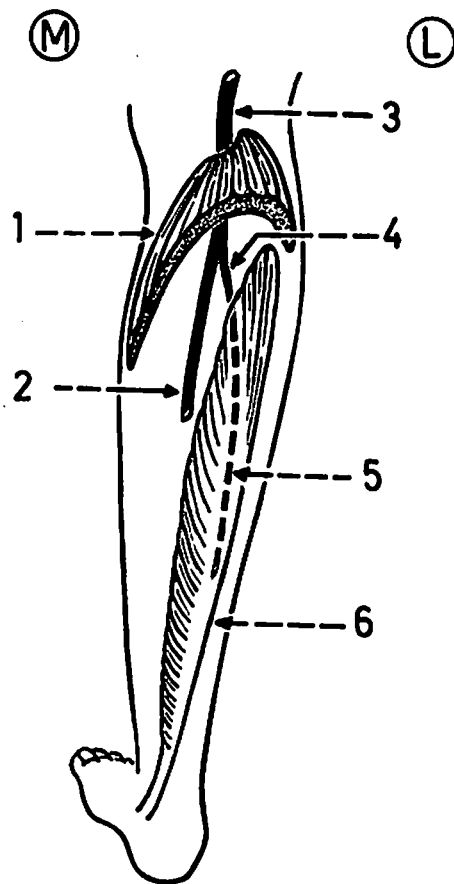


Fig.(237): COURSE OF PERONEAL ARTERY

The peroneal artery arises from the posterior tibial, 1 inch below the lower border of popliteus (origin of posterior tibial artery). It runs obliquely downwards and laterally to reach the fibula and then continues vertically downwards along the back of the fibula under cover of the flexor hallucis longus. It ends at the inferior tibiofibular joint by giving off terminal calcanean branches.

1. soleus.
2. posterior tibial artery (descends vertically in the midline of the back of the leg).
3. popliteal artery.
4. oblique part of peroneal artery.
5. vertical part of peroneal artery (deep to flexor hallucis longus).
6. flexor hallucis longus.

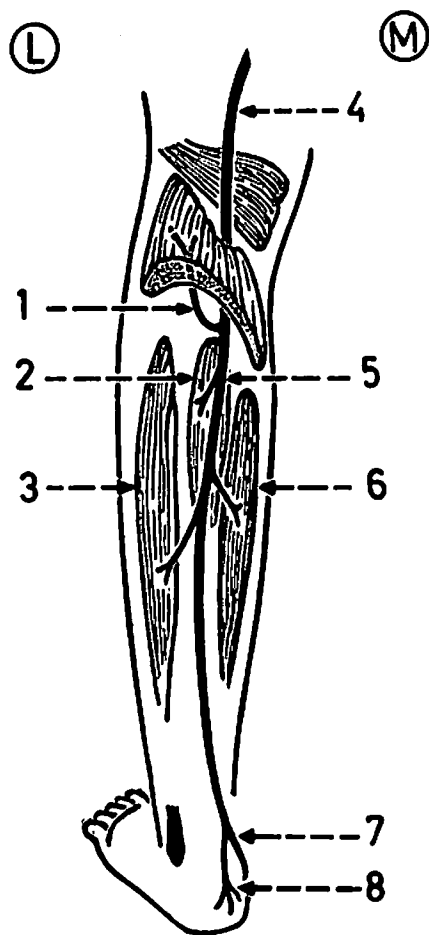
TIBIAL NERVE IN THE LEG

Fig.(238): TIBIAL NERVE IN THE LEG

It descends vertically in the back of the leg and gives off branches to 4 muscles: soleus, tibialis posterior, flexor digitorum longus and flexor hallucis longus.

1. branch to soleus.
2. tibialis posterior.
3. flexor hallucis longus.
4. tibial nerve in popliteal fossa.
5. tibial nerve in the back of the leg.
6. flexor digitorum longus.
7. termination of tibial nerve.
8. medial calcaneal branch.

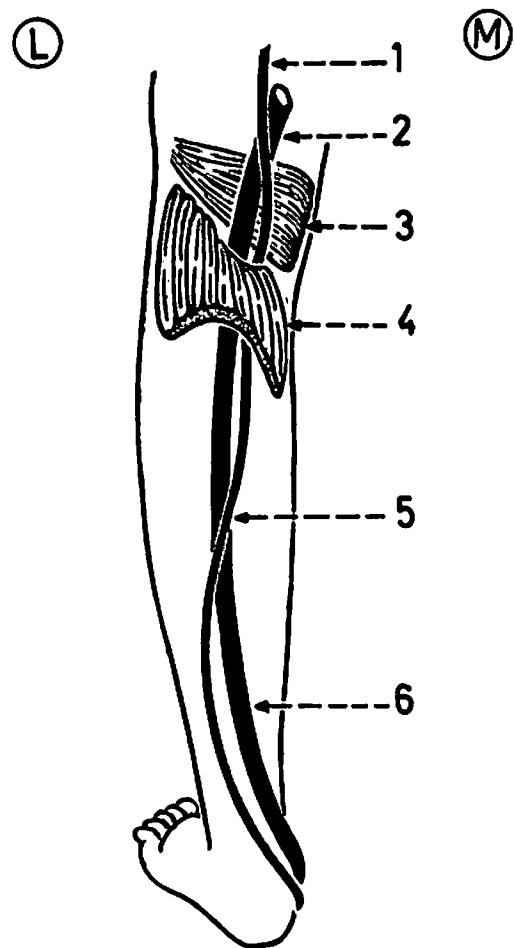


Fig.(239): RELATIONS OF TIBIAL NERVE TO POPLITEAL AND POSTERIOR TIBIAL ARTERIES

The tibial nerve makes 2 crosses to the artery: one in popliteal fossa and the other in the leg.

1. tibial nerve in popliteal fossa.
2. 1st cross (from lateral to medial).
3. popliteus.
4. soleus.
5. 2nd cross (from medial to lateral).
6. posterior tibial artery.

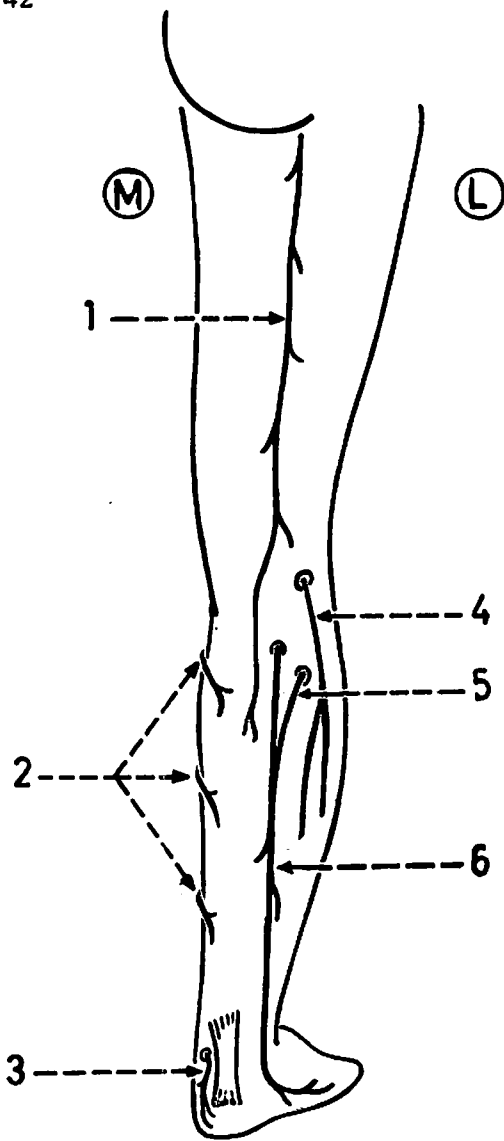


Fig.(240): CUTANEOUS NERVES OF THE BACK OF THIGH AND LEG

1. posterior cutaneous nerve of thigh (sacral plexus).
2. branches from saphenous nerve (femoral).
3. calcaneal branch of tibial.
4. lateral cutaneous nerve of calf (common peroneal).
5. sural communicating nerve (common peroneal).
6. sural nerve (tibial).

* The posterior cutaneous nerve of thigh descends to the middle of the calf of the leg.

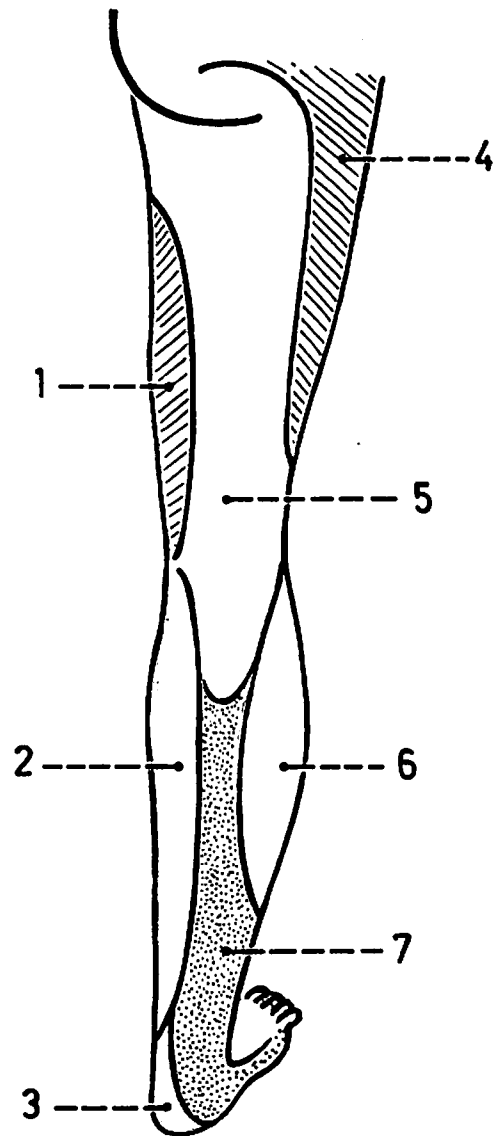


Fig.(241): SKIN AREAS SUPPLIED BY CUTANEOUS NERVES ON THE BACK OF THIGH AND LEG

1. medial cutaneous nerve of thigh (femoral).
2. saphenous nerve (femoral).
3. calcaneal branch of tibial.
4. lateral cutaneous nerve of thigh (lumbar plexus).
5. posterior cutaneous nerve of thigh (sacral plexus).
6. lateral cutaneous nerve of calf (common peroneal).
7. sural nerve (tibial)..

F O O T

DORSUM OF FOOT

Fig.(242): TENDONS ON THE DORSUM OF FOOT

These are the tendons of tibialis anterior, extensor hallucis longus, extensor digitorum longus, extensor digitorum brevis and peroneus tertius.

1. superior extensor retinaculum.
2. inferior extensor retinaculum.
3. extensor digitorum longus.
4. peroneus tertius.
5. tibialis anterior.
6. extensor digitorum brevis.
7. extensor hallucis longus.

* The tendons of tibialis anterior and peroneus tertius do not extend beyond the middle of the foot (one most medial and the other most lateral), while the other tendons are long and extend as far as the toes.

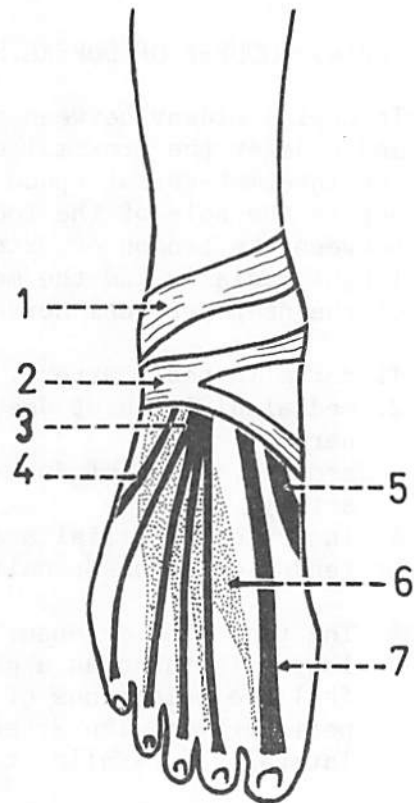


Fig.(243): EXTENSOR DIGITORUM BREVIS

It is the only fleshy mass on the dorsum of the foot (others are tendons). It divides into 4 parts to the medial 4 toes (not the 5th toe).

1. superior extensor retinaculum.
2. inferior extensor retinaculum.
3. origin of the extensor digitorum brevis (from the upper surface of calcaneus).
4. tendon of extensor hallucis longus.
5. most medial part of extensor digitorum brevis (called extensor hallucis brevis).

* Note that the 4 tendons of extensor digitorum brevis go to the medial 4 toes, while the 4 tendons of extensor digitorum longus go to the lateral 4 toes.

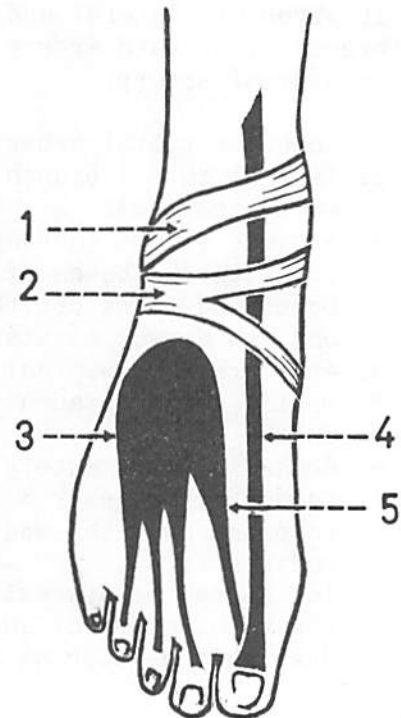


Fig.(244): COURSE OF DORSALIS PEDIS ARTERY

It begins midway between the 2 malleoli and ends at the proximal end of the 1st intermetatarsal space where it enters the sole of the foot. It lies between the tendon of extensor hallucis longus medially and the medial division of the deep peroneal nerve laterally.

1. dorsalis pedis artery.
2. medial division of deep peroneal nerve.
3. arcuate branch of dorsalis pedis artery.
4. insertion of tibialis anterior.
5. tendon of extensor hallucis longus.

* The tendon of extensor hallucis longus is taken as a guide to feel the pulsations of the dorsalis pedis artery. The artery is just lateral and parallel to the tendon.

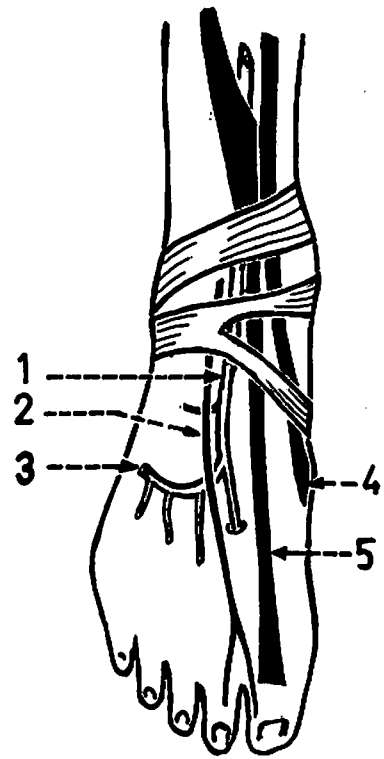
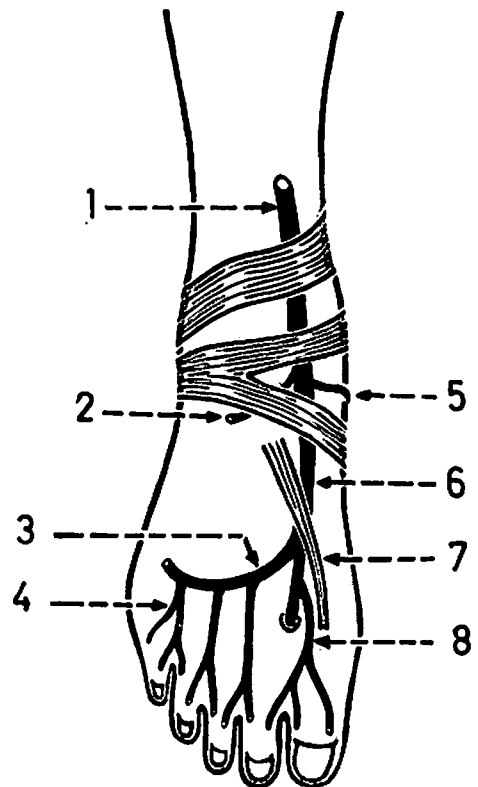


Fig.(245): BRANCHES OF DORSALIS PEDIS ARTERY

It gives off lateral and medial tarsal branches, arcuate artery and 1st dorsal metatarsal artery.

1. anterior tibial artery (in the leg).
2. lateral tarsal branch (runs laterally on the tarsus).
3. arcuate artery (curves laterally opposite the bases of metatarsal bones and gives off the 2nd, 3rd and 4th dorsal metatarsal arteries).
4. 4th dorsal metatarsal artery.
5. medial tarsal branch (runs medially on the tarsus).
6. dorsalis pedis artery (pedis = foot).
7. tendon of extensor hallucis brevis (crosses over the end of dorsalis pedis artery).
8. 1st dorsal metatarsal artery (from the termination of dorsalis pedis just before entering the sole).



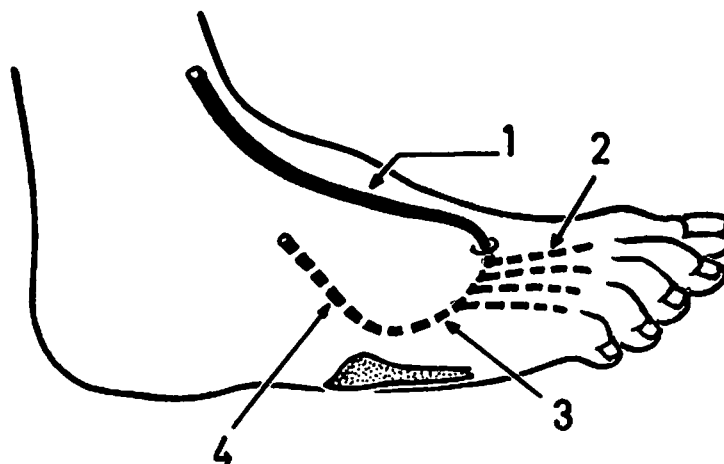


Fig.(246): TERMINATION OF DORSALIS PEDIS IN THE SOLE OF FOOT

The artery leaves the dorsum of the foot by passing between the 2 heads of the 1st dorsal interosseous muscle to enter the sole of the foot. There it joins the termination of the plantar arch.

1. dorsalis pedis artery (on the dorsum of foot).
2. plantar metatarsal arteries (from the plantar arch in the sole of foot).
3. plantar arch (continuation of the lateral plantar artery in the sole).
4. lateral plantar artery (in the sole of foot).

* The communication between dorsalis pedis artery and plantar arch is a main anastomosis between the anterior and posterior tibial arteries.

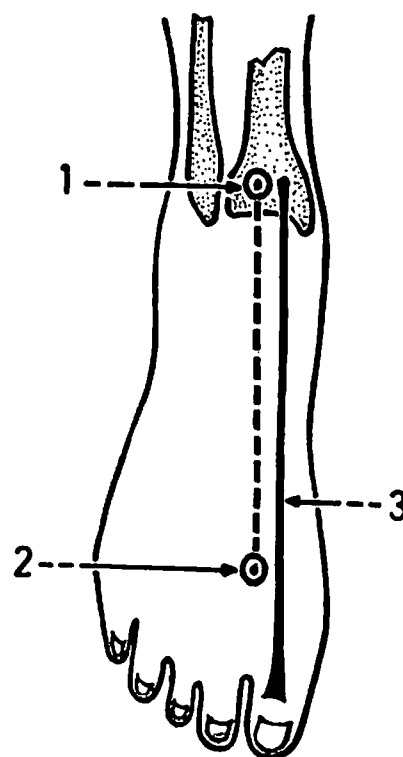
Fig.(247): SURFACE ANATOMY OF DORSALIS PEDIS ARTERY

It is represented by a line drawn between 2 points:

Point (1) : on the front of ankle joint midway between the 2 malleoli.

Point (2) : at the proximal end of the 1st intermetatarsal space.

1. point (1).
2. point (2).
3. tendon of extensor hallucis longus.



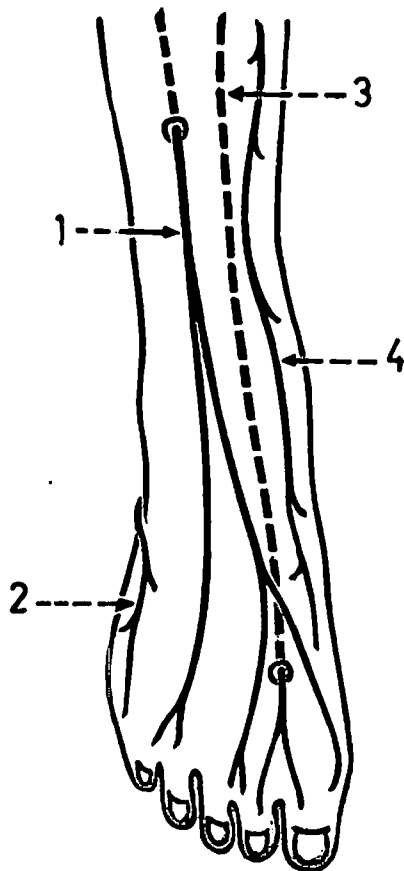


Fig.(248): CUTANEOUS NERVES OF THE DORSUM OF FOOT

These are terminal branches of the superficial and deep peroneal nerves in addition to the saphenous and sural nerves.

1. superficial peroneal nerve.
2. sural nerve (on lateral border).
3. deep peroneal nerve.
4. saphenous nerve (on medial border).

* The superficial peroneal nerve becomes subcutaneous in the lower 1/3 of the leg, while the deep peroneal nerve becomes subcutaneous at the proximal end of the 1st intermetatarsal space.

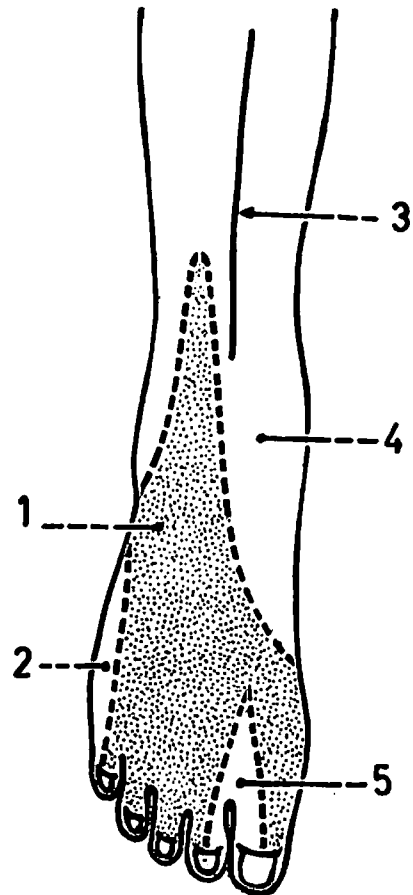


Fig.(249): SKIN AREAS SUPPLIED BY CUTANEOUS NERVES ON THE DORSUM OF FOOT

1. superficial peroneal nerve (most of the dorsum and lower part of anterolateral surface of leg).
2. sural nerve (limited area on lateral border).
3. anterior border of tibia.
4. saphenous nerve (on medial side as far as the metatarso-phalangeal joint of big toe).
5. deep peroneal nerve (limited area confined to adjacent sides of 1st and 2nd toes).

* Note that the skin of the dorsum of foot is mainly supplied by the superficial peroneal nerve.

SOLE OF FOOT

Fig.(250): PLANTAR APONEUROSIS

It is the thickened deep fascia of the sole of foot. It is divided into thin medial and lateral parts and a much thicker central part. The central part divides at the metatarso-phalangeal joints into 5 slips, a slip for each toe.

1. plantar digital nerve.
2. central part of the aponeurosis.
3. medial part of the aponeurosis.
4. tuberosity of calcaneus.
5. slips of central part of the aponeurosis.
6. lateral part of the aponeurosis.

* The central part of the aponeurosis exactly overlies the flexor digitorum brevis and is blended with it.

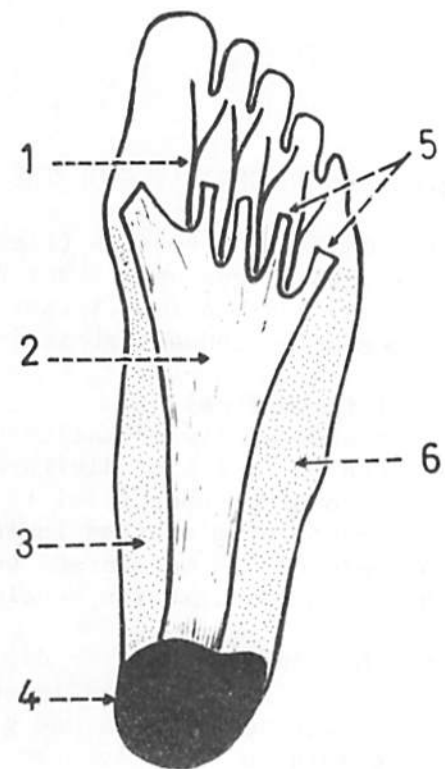


Fig.(251): FIRST LAYER OF THE SOLE

It comprises 3 muscles : abductor hallucis (medially), flexor digitorum brevis (in the middle) and abductor digiti minimi (laterally).

1. flexor digitorum brevis (gives 4 tendons to lateral 4 toes).
2. abductor hallucis (for the big toe).
3. abductor digiti minimi (for the little toe).
4. tuberosity of calcaneus.

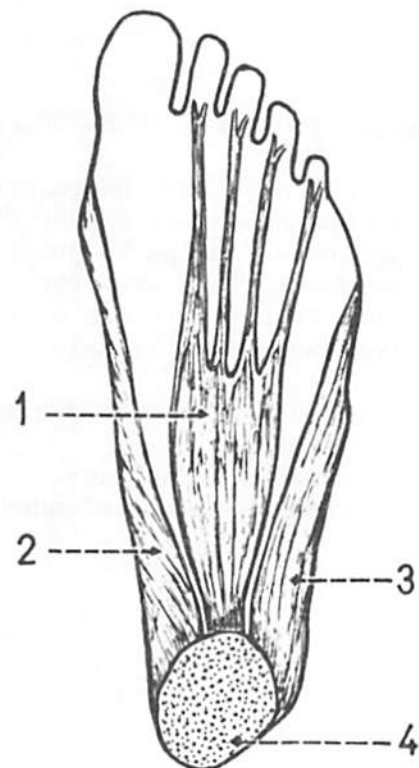


Fig.(252): SECOND LAYER OF THE SOLE

It consists of tendons (flexor hallucis longus and flexor digitorum longus) and muscles (flexor accessorius and 4 lumbricals).

1. 1st lumbrical.
2. tendon of flexor hallucis longus.
3. tendon of flexor digitorum longus (crossing superficial to the tendon of flexor hallucis longus).
4. base of 5th metatarsal bone.
5. flexor accessorius muscle.

* The tendon of flexor digitorum longus receives the insertion of flexor accessorius and gives origin to the 4 lumbricals.

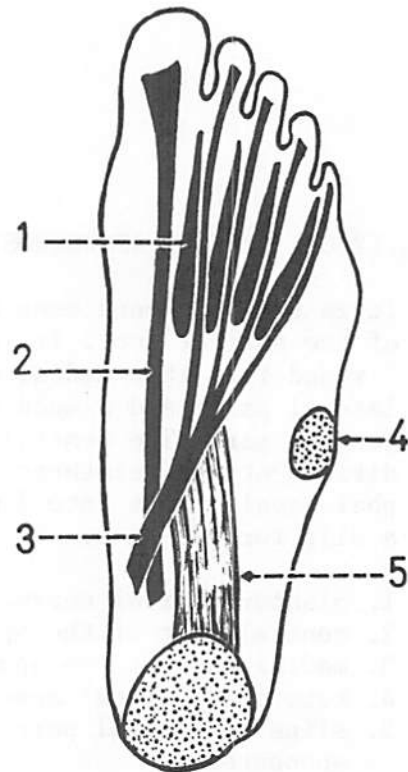


Fig.(253): FLEXOR ACCESSORIUS MUSCLE

It extends from the calcaneus to the tendon of flexor digitorum longus. It helps to put this tendon in line with the toes so that it pulls in the axis of the toes and not obliquely.

1. tendon of flexor digitorum longus.
2. flexor accessorius.
3. tuberosity of calcaneus.

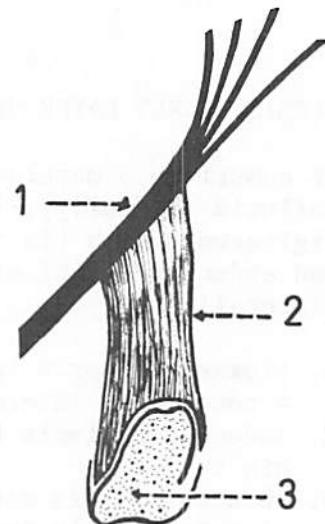


Fig.(254): INSERTION OF FLEXOR
DIGITORUM BREVIS
AND LONGUS

The tendon of flexor digitorum brevis is splitted opposite the proximal phalanx by the tendon of flexor digitorum longus. The 2 slips become reversed and are inserted into the margins of the plantar surface of the middle phalanx, thus forming a tunnel for the tendon of the flexor digitorum longus which is inserted into the base of the terminal phalanx.

1. insertion of flexor digitorum longus.
2. reversed part of the slip of the tendon of flexor digitorum brevis.
3. tendon of flexor digitorum brevis splitted.
4. tendon of flexor digitorum longus before piercing the tendon of flexor digitorum brevis.

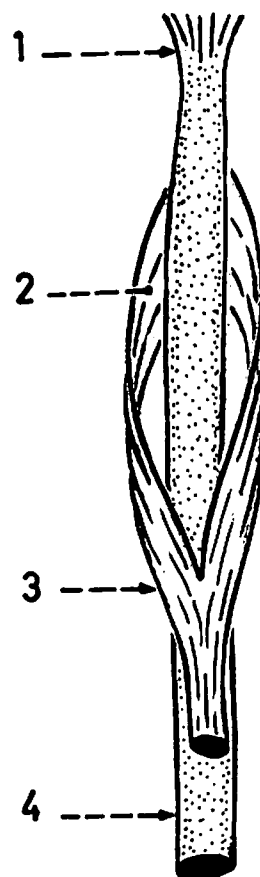


Fig.(255): SPLITTED TENDON OF
INSERTION OF FLEXOR
DIGITORUM BREVIS

1. reversed parts of the 2 slips of the tendon (inserted into the middle phalanx).
2. tendon before splitting.

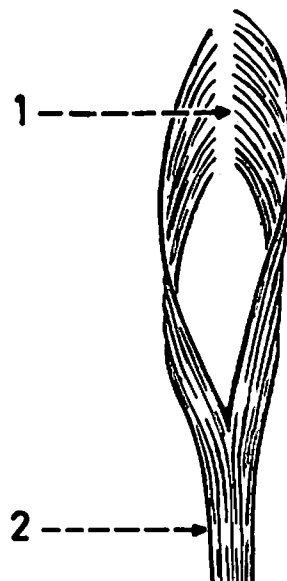


Fig.(256): FIBROUS FLEXOR SHEATHS

The fibrous flexor sheath forms together with the phalanges of the toes an osteo-fascial canal through which the tendons of the flexor digitorum longus and brevis pass.

1. fibrous flexor sheath.
2. flexor tendons within the osteo-fascial canal.
3. plantar ligament of M/P (metatarso-phalangeal) joint.
4. deep transverse metatarsal ligament.
5. base of proximal phalanx.

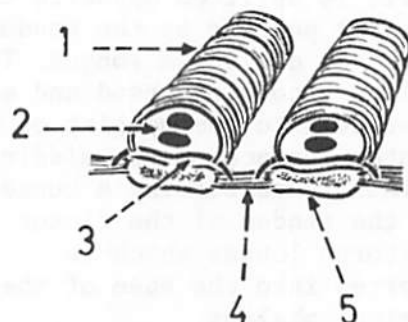


Fig.(257): RELATION OF THE SLIPS OF THE PLANTAR APONEUROSIS TO THE FIBROUS FLEXOR SHEATH

Each of the 5 slips of the plantar aponeurosis becomes splitted into 2 parts which turn deeply towards the metatarso-phalangeal joint at the entrance of the osteo-fascial canal. There, these 2 parts are attached to the margins of the fibrous flexor sheath as well as to the plantar ligament of the M/P joint.

1. fibrous flexor sheath.
2. slip of plantar aponeurosis (splitted).
3. plantar ligament of M/P joint.
4. deep transverse metatarsal ligament.

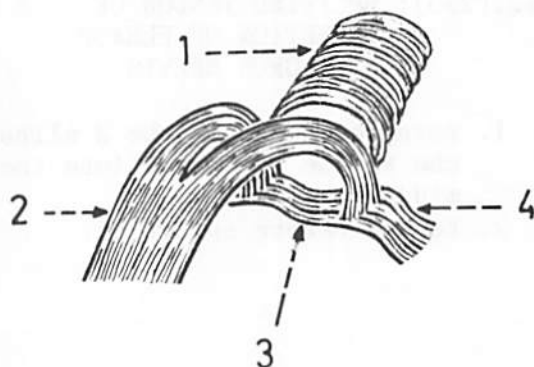


Fig.(258): THIRD LAYER OF THE SOLE

It consists of 3 muscles: flexor hallucis brevis, adductor hallucis and flexor digiti minimi brevis.

1. flexor hallucis brevis (lies over the 1st metatarsal bone and has 2 fleshy bellies).
2. transverse head of adductor hallucis.
3. oblique head of adductor hallucis.
4. flexor digiti minimi brevis (lies over the 5th metatarsal bone).

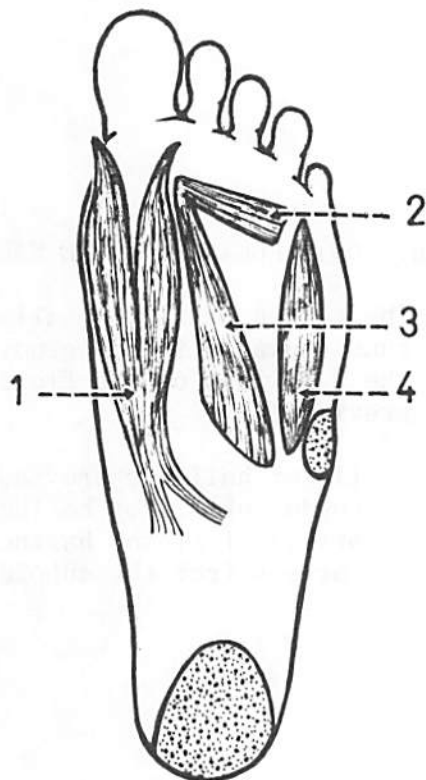


Fig.(259): INSERTION OF FLEXOR HALLUCIS BREVIS

The flexor hallucis brevis has 2 fleshy bellies (medial and lateral). Its medial belly is inserted together with the abductor hallucis into the medial side of the base of proximal phalanx of big toe, while its lateral belly is inserted together with the adductor hallucis into the lateral side of the base of the proximal phalanx of big toe.

1. abductor hallucis.
2. flexor hallucis brevis.
3. transverse head of adductor hallucis.
4. oblique head of adductor hallucis.

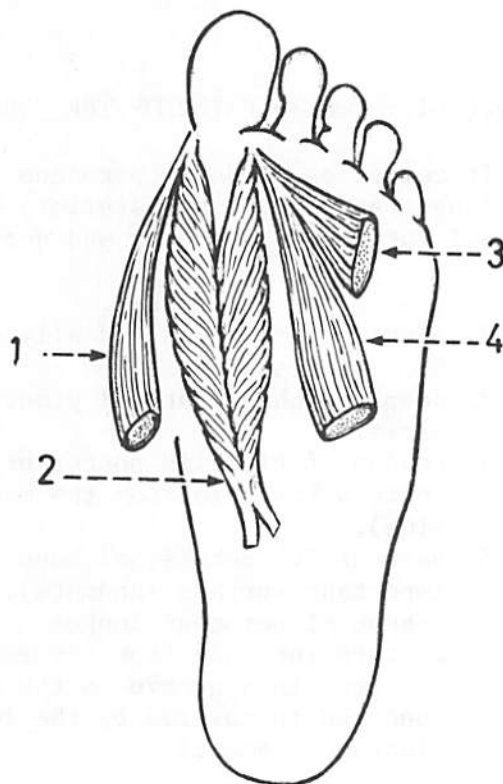


Fig.(260): FLEXORS OF THE HALLUX

The tendon of flexor hallucis longus runs forwards in the groove between the 2 bellies of the flexor hallucis brevis.

1. flexor hallucis brevis.
2. tendon of flexor hallucis longus.
3. origin of flexor hallucis brevis (arises from the cuboid bone).

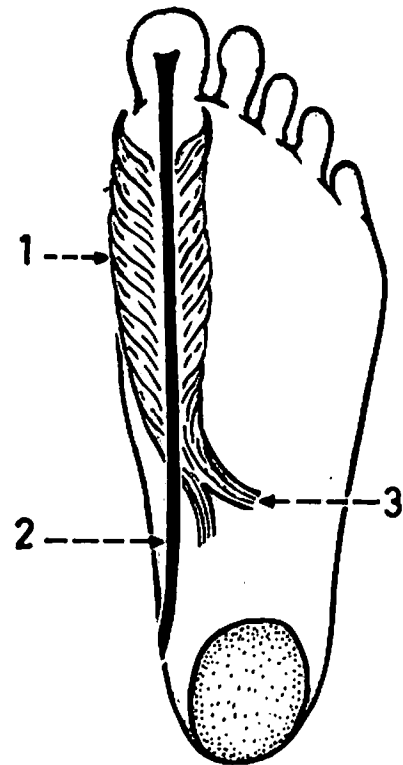


Fig.(261): FOURTH LAYER OF THE SOLE

It comprises tendons (peroneus longus and tibialis posterior) and all interossei (plantar and dorsal).

1. one of the interossei.
2. plantar arch (runs medially over the interossei).
3. deep branch of lateral plantar nerve.
4. tendon of tibialis posterior (enters the sole from the medial side).
5. base of 5th metatarsal bone (an important surface landmark).
6. tendon of peroneus longus (enters the sole from the lateral side; it lies in a groove on the cuboid bone and is covered by the long plantar ligament).

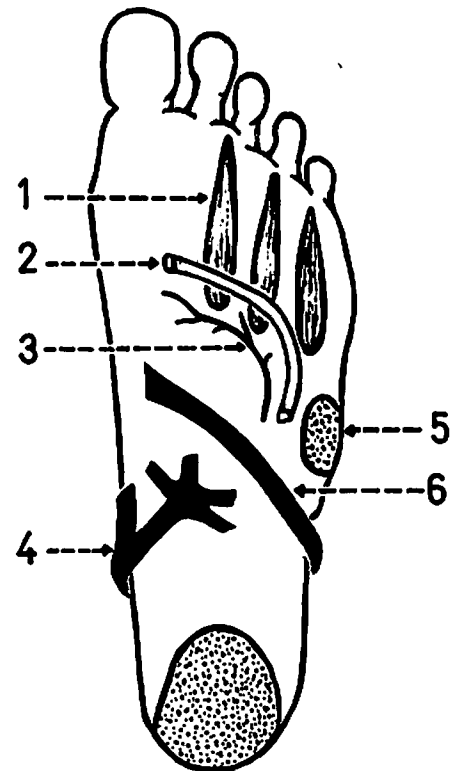


Fig.(262): PLANTAR INTEROSSEI

These are 3 muscles for the lateral 3 toes. Each muscle lies on the metatarsal bone of the toe on which it acts. They adduct the respective toes towards the 2nd toe through which the axis of adduction and abduction lies.

1. 3rd plantar interosseous.
2. axis of adduction and abduction.

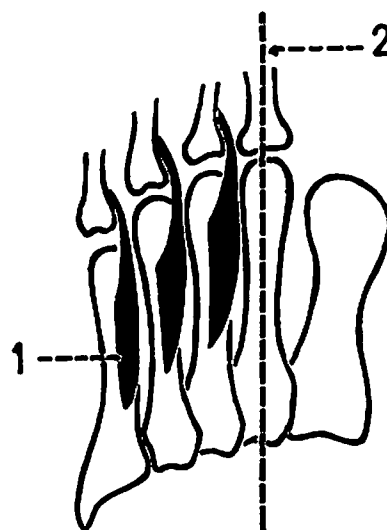
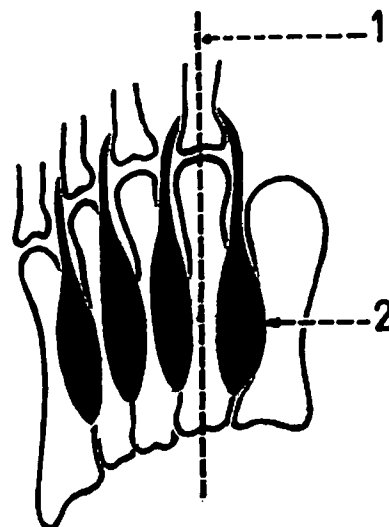


Fig.(263): DORSAL INTEROSSEI

These are 4 muscles situated between the metatarsal bones. They abduct the 2nd, 3rd and 4th toes.

1. axis of adduction and abduction.
2. 1st dorsal interosseous.



PLANTAR ARTERIES

Fig.(264): PLANTAR ARTERIES

These are medial and lateral plantar arteries which arise from the posterior tibial artery deep to the flexor retinaculum. The medial plantar artery runs forwards on the medial side of the sole, while the lateral artery runs forwards and laterally towards the base of the 5th metatarsal bone then turns medially to form the plantar arch.

1. 1st plantar metatarsal artery (from plantar arch).
2. medial plantar artery (alongside the abductor hallucis).
3. plantar arch.
4. abductor hallucis.
5. plantar digital artery (to lateral side of the little toe).
6. base of 5th metatarsal.
7. lateral plantar artery.
8. flexor accessorius.

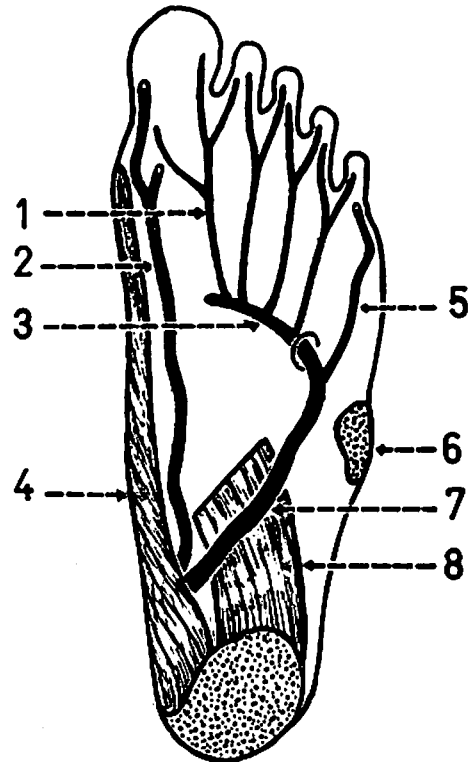


Fig.(265): RELATIONS OF LATERAL PLANTAR ARTERY

It runs forwards and laterally between the 1st and 2nd layers of the sole, in company with the lateral plantar nerve.

1. 1st lumbrical muscle.
2. tendon of flexor hallucis longus.
3. tendon of flexor digitorum longus.
4. lateral plantar nerve.
5. base of 5th metatarsal bone. (where the artery changes its direction medially).
6. lateral plantar artery.
7. flexor accessorius (deep to the lateral plantar artery).

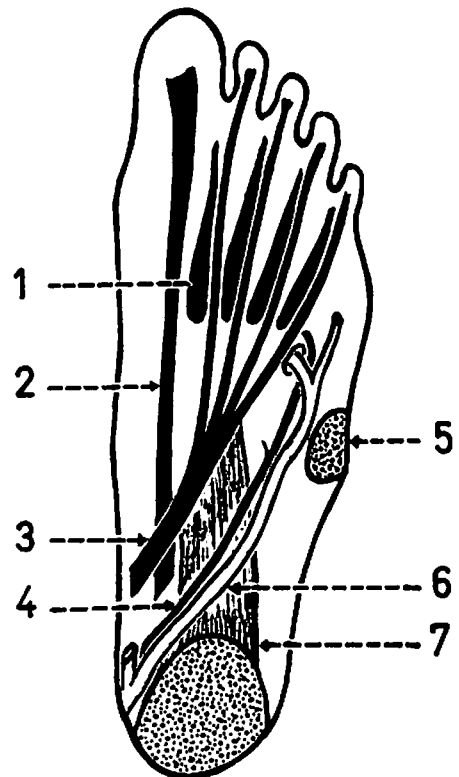


Fig.(266): SURFACE ANATOMY OF MEDIAL PLANTAR ARTERY

It is represented by a line drawn between 2 points, in the direction of the 1st interdigital cleft:

Point (1): midway between the medial malleolus and the heel.

Point (2): at the level of the navicular bone.

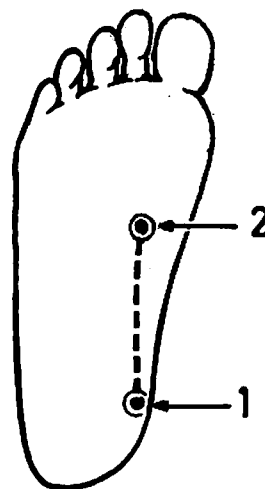


Fig.(267): SURFACE ANATOMY OF LATERAL PLANTAR ARTERY

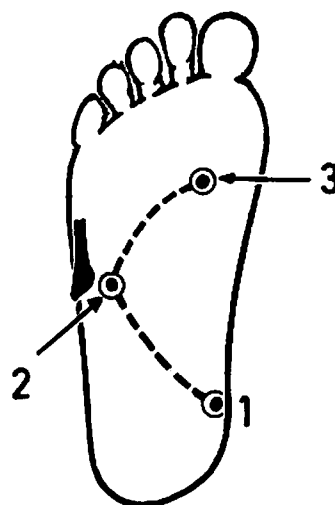
It is represented by a line drawn through 3 points:

Point (1): midway between the heel and medial malleolus.

Point (2): 1 inch medial to the base of 5th metatarsal bone.

Point (3): at proximal end of the 1st intermetatarsal space.

- * The part from point (1) to point (2) runs forwards and laterally and represents the lateral plantar artery, while the part between point (2) and point (3) runs forwards and medially and represents the plantar arch.



PLANTAR NERVES

Fig.(268): PLANTAR NERVES

These are medial and lateral plantar nerves which arise from the tibial nerve deep to the flexor retinaculum. The medial plantar nerve runs forwards in the interval between the abductor hallucis and flexor digitorum brevis, while the lateral plantar nerve runs forwards and laterally towards the base of 5th metatarsal between the 1st and 2nd layers of the sole of the foot.

1. medial plantar nerve.
2. flexor digitorum brevis.
3. abductor hallucis.
4. end of tibial nerve.
5. superficial branch of lateral plantar nerve.
6. deep branch of lateral plantar nerve.
7. abductor digiti minimi.

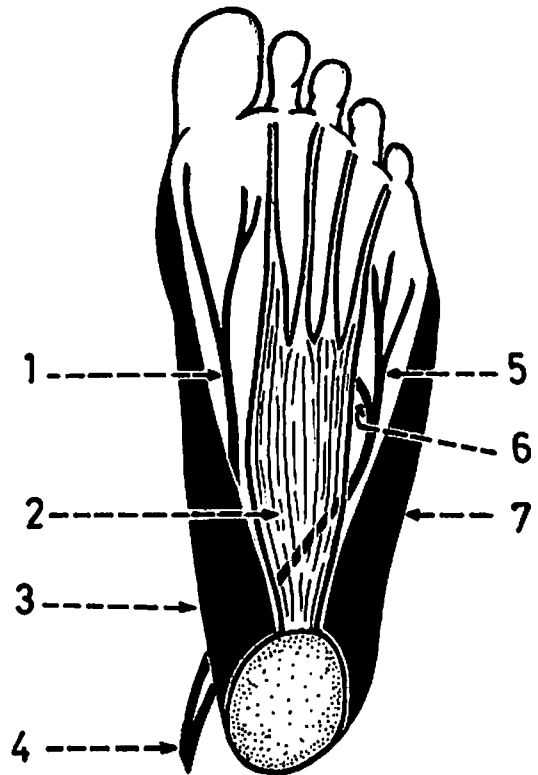


Fig.(269): BRANCHES OF PLANTAR NERVES

1. digital branches of medial plantar nerve.
2. medial plantar nerve (runs forwards towards the cleft between the 1st and 2nd toes).
3. superficial branch of lateral plantar nerve.
4. deep branch of lateral plantar nerve (runs medially between the 3rd and 4th layers of the sole in company with the plantar arch).
5. base of 5th metatarsal.
6. trunk of lateral plantar nerve.
7. flexor accessorius.

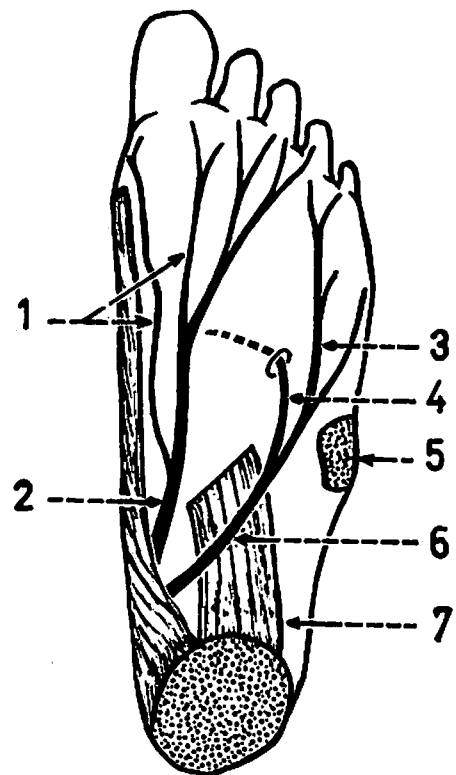


Fig.(270): SKIN AREAS OF THE SOLE
SUPPLIED BY CUTANEOUS NERVES

1. lateral plantar nerve.
2. sural nerve.
3. medial plantar nerve.
4. saphenous nerve (a limited area).
5. calcaneal branch of tibial nerve.

* Almost all the skin of the sole is supplied from the tibial nerve as compared with the skin of the dorsum of the foot which is mainly supplied by the common peroneal nerve.

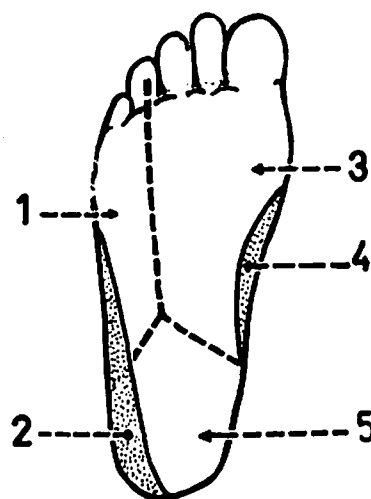


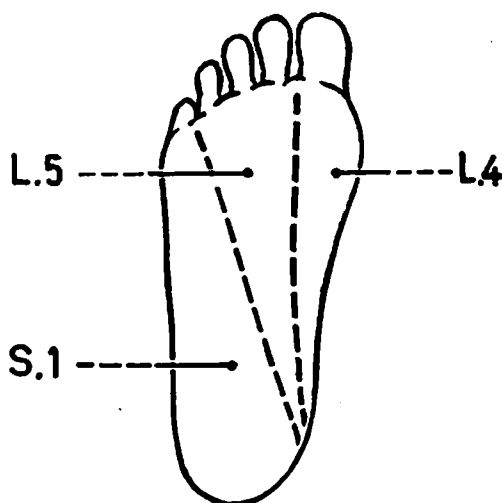
Fig.(271): SEGMENTAL NERVE SUPPLY OF
THE SKIN OF THE SOLE
(DERMATOMES)

The skin of the sole of the foot consists of 3 dermatomes which are supplied by 3 spinal segments (L.4, L.5, S.1).

L.4: the medial and includes the big toe.

L.5: the middle and includes the middle 3 toes.

S.1: the lateral and includes the little toe.



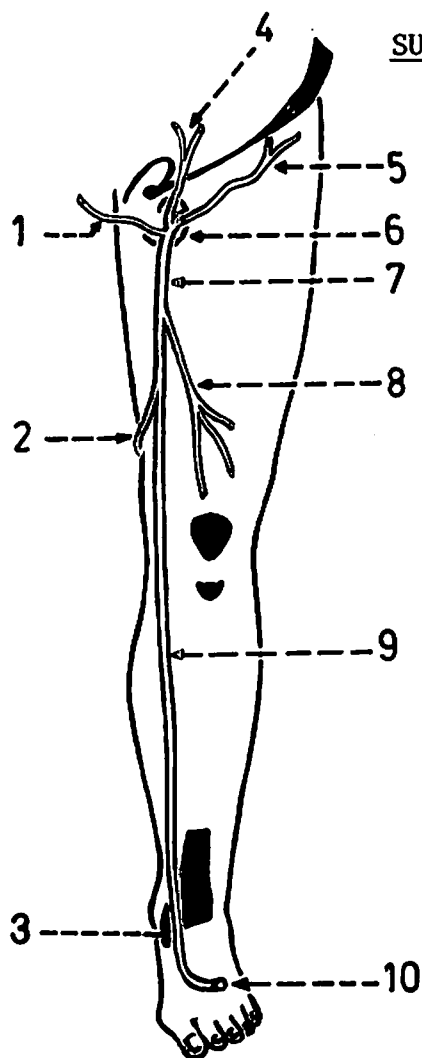
SUPERFICIAL VEINS

Fig.(272): GREAT SAPHENOUS VEIN

It begins on the medial side of the dorsum of foot and ends by passing through the saphenous opening to open into the femoral vein.

1. superficial external pudendal vein.
2. communication with the small saphenous vein.
3. medial malleolus(behind the vein).
4. superficial epigastric vein.
5. superficial circumflex iliac vein.
6. saphenous opening.
7. great saphenous vein.
8. anterior femoral cutaneous vein.
9. great saphenous vein on the medial border of tibia.
10. dorsal venous arch.

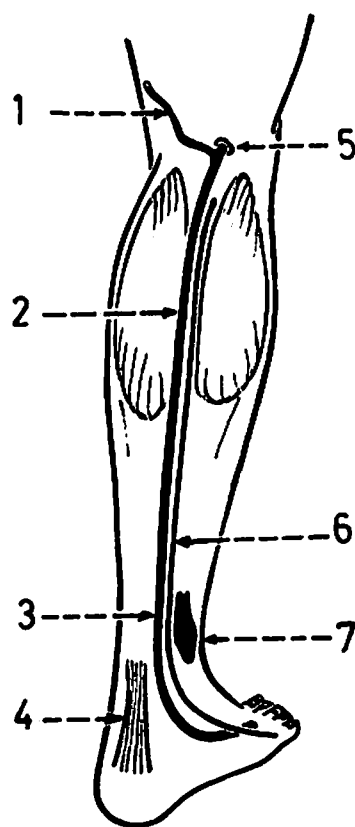


Fig.(273): SMALL SAPHENOUS VEIN

It begins on the lateral side of the dorsum of foot and ends in the popliteal fossa by joining the popliteal vein.

1. communication with the great saphenous vein.
2. small saphenous vein between the 2 bellies of gastrocnemius.
3. small saphenous vein behind the lateral malleolus.
4. tendo-calcaneus.
5. small saphenous vein piercing the roof of popliteal fossa.
6. sural nerve (accompanies the small saphenous vein).
7. lateral malleolus.

* The small saphenous vein is shorter and runs on the back of the leg.

Fig.(274): SITES OF PERFORATING VEINS

The perforating (communicating) veins perforate the deep fascia to connect the superficial veins with the deep veins. They are commonly present on the medial side of the ankle joint, lower 1/3 of the medial border of tibia and lower 1/3 of medial side of thigh. The termination of the great saphenous vein which passes through the saphenous opening can be considered as a perforating segment.

1. saphenous opening.
2. site of perforating vein on medial side of thigh.
3. site of perforating vein a short distance above the ankle.
4. site of perforating vein just below the ankle.

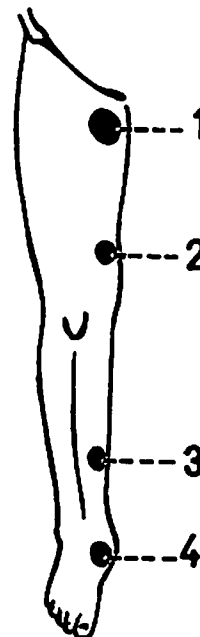


Fig.(275): SURFACE ANATOMY OF GREAT SAPHEOUS VEIN

It is represented by a line drawn between 3 points:

Point (1): in front of the medial malleolus.

Point (2): a hand's breadth behind the medial border of the patella.

Point (3): 4 cm below and lateral to the pubic tubercle (this point corresponds to the saphenous opening).

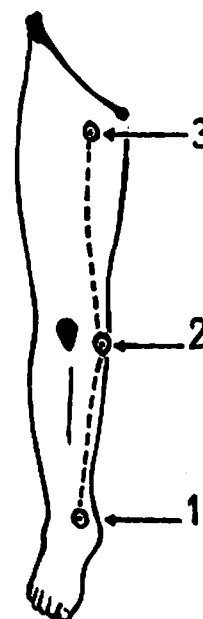


Fig.(276): NORMAL VENOUS RETURN
IN LOWER LIMB

Venous blood normally flows from the superficial to the deep veins of lower limb through the perforating veins. This normal flow is guarded by valves in the perforating veins. Compression of the deep veins by contraction of the surrounding muscles pushes the venous blood upwards towards the heart.

1. deep fascia .
2. deep vein (tibial, popliteal and femoral).
3. saphenous opening (a perforation in the deep fascia).
4. great saphenous vein.
5. sites of perforating veins (the blood flows from superficial to deep veins).

* The arrows indicate the direction of flow of blood.

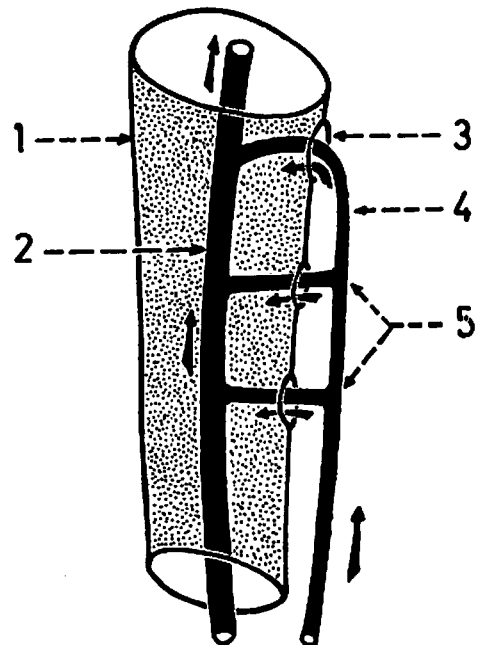
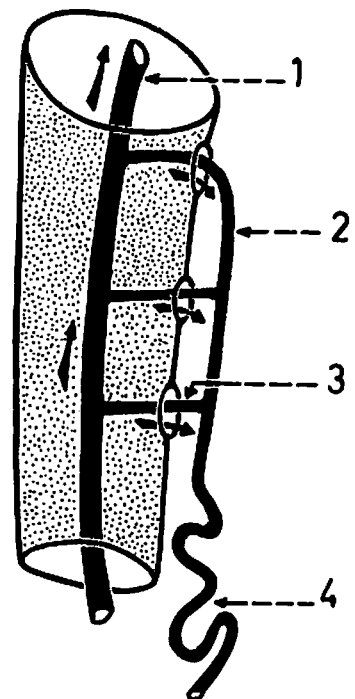


Fig.(277): ABNORMAL VENOUS RETURN
IN LOWER LIMB

Damage to the valves in the perforating veins allows the blood in the deep veins (with high pressure) to pass into the superficial veins which dilate, elongate and become tortuous (forming varicose veins).

1. deep vein.
2. superficial vein.
3. perforating vein (the blood flows in the reverse direction).
4. varicose veins.



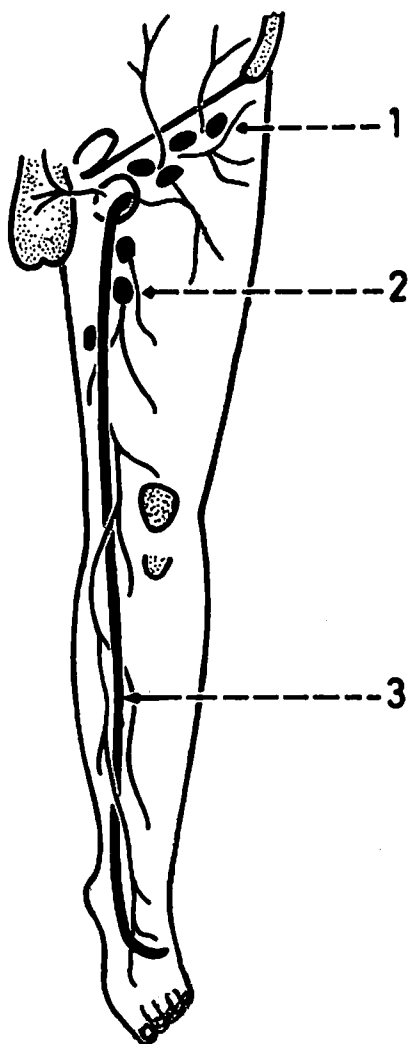


Fig.(278): LYMPH VESSELS ALONG
GREAT SAPHENOUS VEIN

The superficial lymph vessels accompany the great saphenous vein to end in the vertical group of superficial inguinal lymph nodes.

1. horizontal group of superficial inguinal lymph nodes (below and parallel to inguinal ligament).
2. vertical group of superficial inguinal lymph nodes (alongside the great saphenous vein).
3. great saphenous vein.

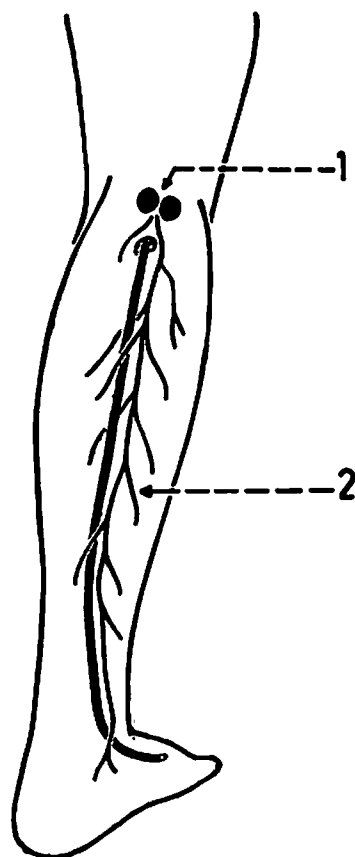


Fig.(279): LYMPH VESSELS ALONG
SMALL SAPHENOUS VEIN

The superficial lymph vessels which accompany the small saphenous vein end in the popliteal lymph nodes.

1. popliteal nodes (present in the popliteal fossa beneath the deep fascia).
2. vessels alongside the small saphenous vein.

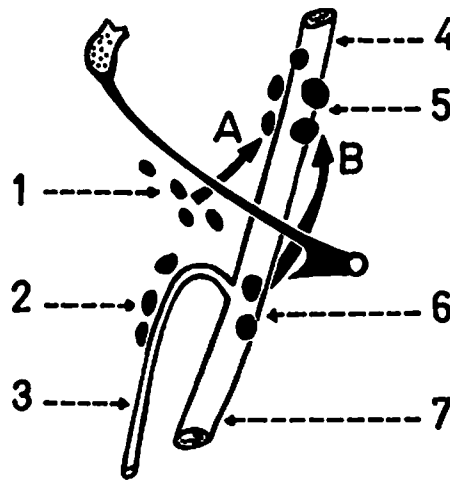


Fig.(280); INGUINAL LYMPH NODES

The inguinal lymph nodes are either superficial (in superficial fascia) or deep (beneath deep fascia). The superficial nodes are arranged in 2 groups (horizontal and vertical). The horizontal group lies horizontally just below and parallel to inguinal ligament, while the vertical group lies vertically along the uppermost part of the great saphenous vein. The deep group of inguinal lymph nodes are few in number (2-3) and are arranged vertically along the uppermost part of the femoral vein.

1. horizontal group of superficial inguinal lymph nodes.
 2. vertical group of superficial inguinal lymph nodes.
 3. great saphenous vein.
 4. external iliac vein.
 5. external iliac lymph nodes (inside the pelvis alongside the external iliac vein).
 6. deep inguinal lymph nodes (2-3 nodes, lie along the uppermost part of femoral vein with one of them present in the femoral canal).
 7. femoral vein.
- A. arrow indicating the route of efferent vessels from the superficial inguinal nodes to the external iliac nodes behind the inguinal ligament.
- B. arrow indicating the route of efferent vessels from the deep inguinal nodes to the external iliac nodes via the femoral canal.
- * The superficial inguinal nodes send most of their efferents through the saphenous opening to end in the deep inguinal nodes.

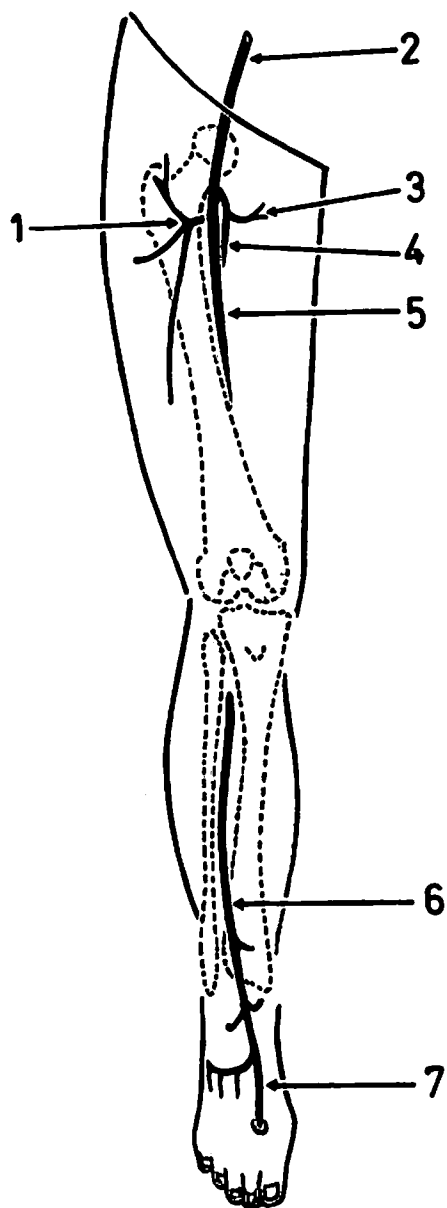
ARTERIES OF LOWER LIMB

Fig.(281): ARTERIES OF LOWER LIMB
(seen from in front)

1. lateral circumflex femoral a.
2. external iliac a.
3. medial circumflex femoral a.
4. profunda femoris a.
5. femoral a.
6. anterior tibial a.
7. dorsalis pedis a.

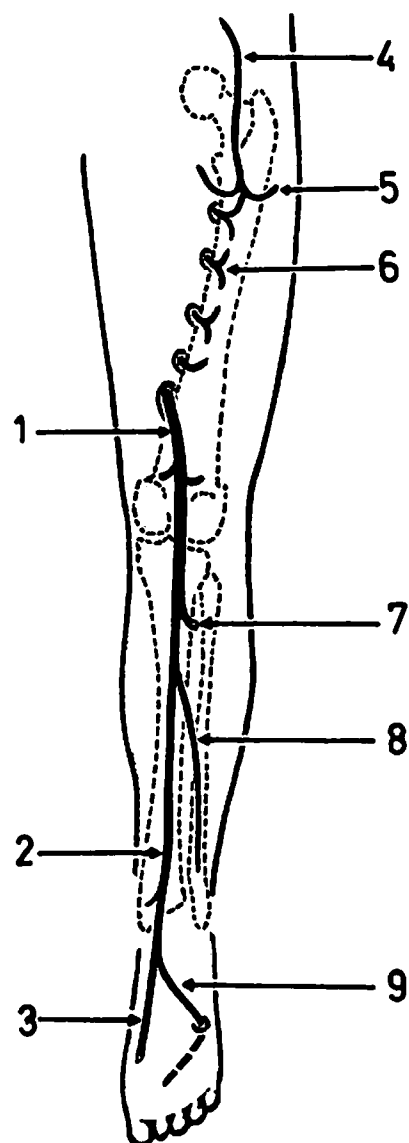


Fig.(282): ARTERIES OF LOWER LIMB
(seen from behind)

1. popliteal a.
2. posterior tibial a.
3. medial plantar a.
4. inferior gluteal a.
5. cruciate anastomosis.
6. perforating branches of profunda femoris a.
7. beginning of anterior tibial a.
8. peroneal a.
9. lateral plantar a.

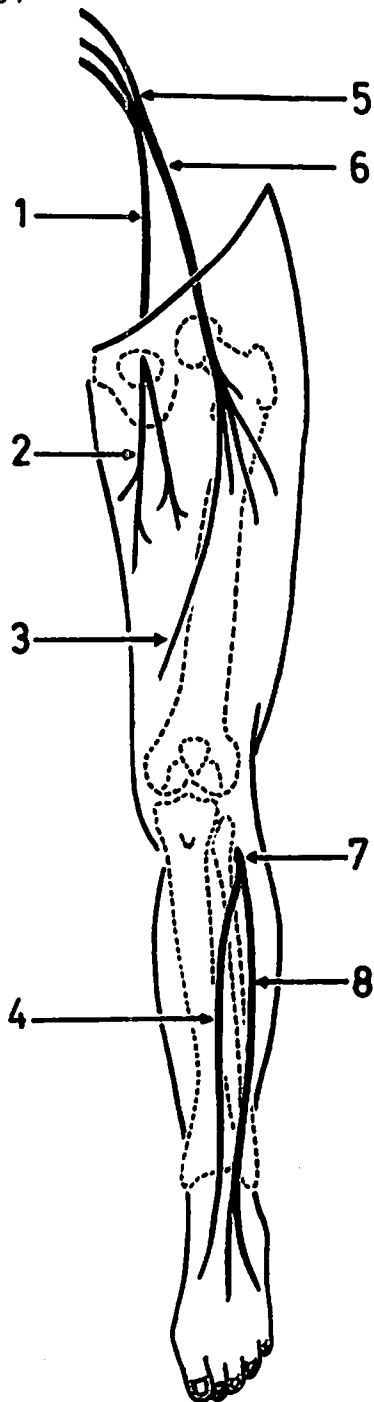
NERVES OF LOWER LIMB

Fig.(283): NERVES OF LOWER LIMB
(seen from in front)

1. obturator n.
2. divisions of obturator n.
3. saphenous n.
4. deep peroneal n.
5. lumbar plexus (L.2,3,4).
6. femoral n.
7. end of common peroneal n.
8. superficial peroneal n.

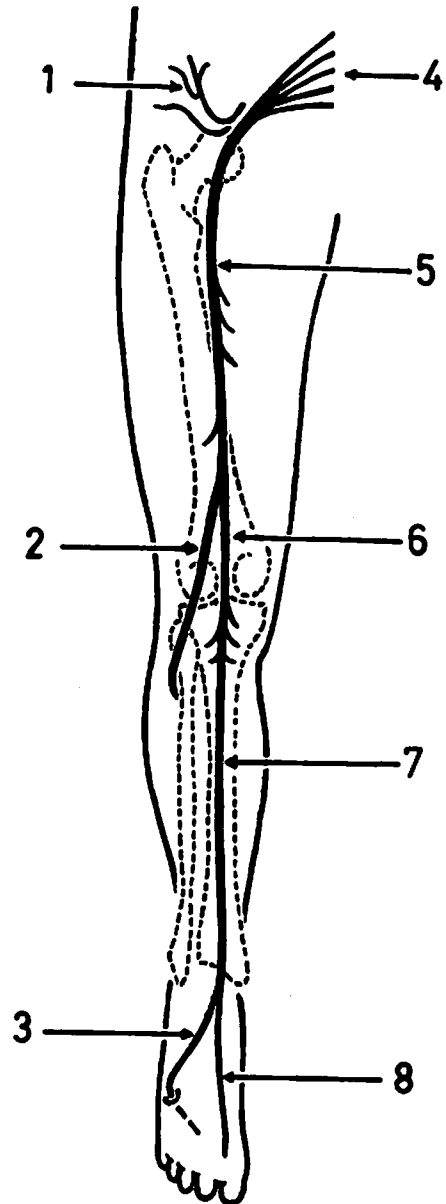


Fig.(284): NERVES OF LOWER LIMB
(seen from behind)

1. gluteal nerves.
2. common peroneal n.
3. lateral plantar n.
4. sacral plexus.
5. sciatic n.
6. tibial n. (in popliteal fossa).
7. tibial n. (in back of leg).
8. medial plantar n.

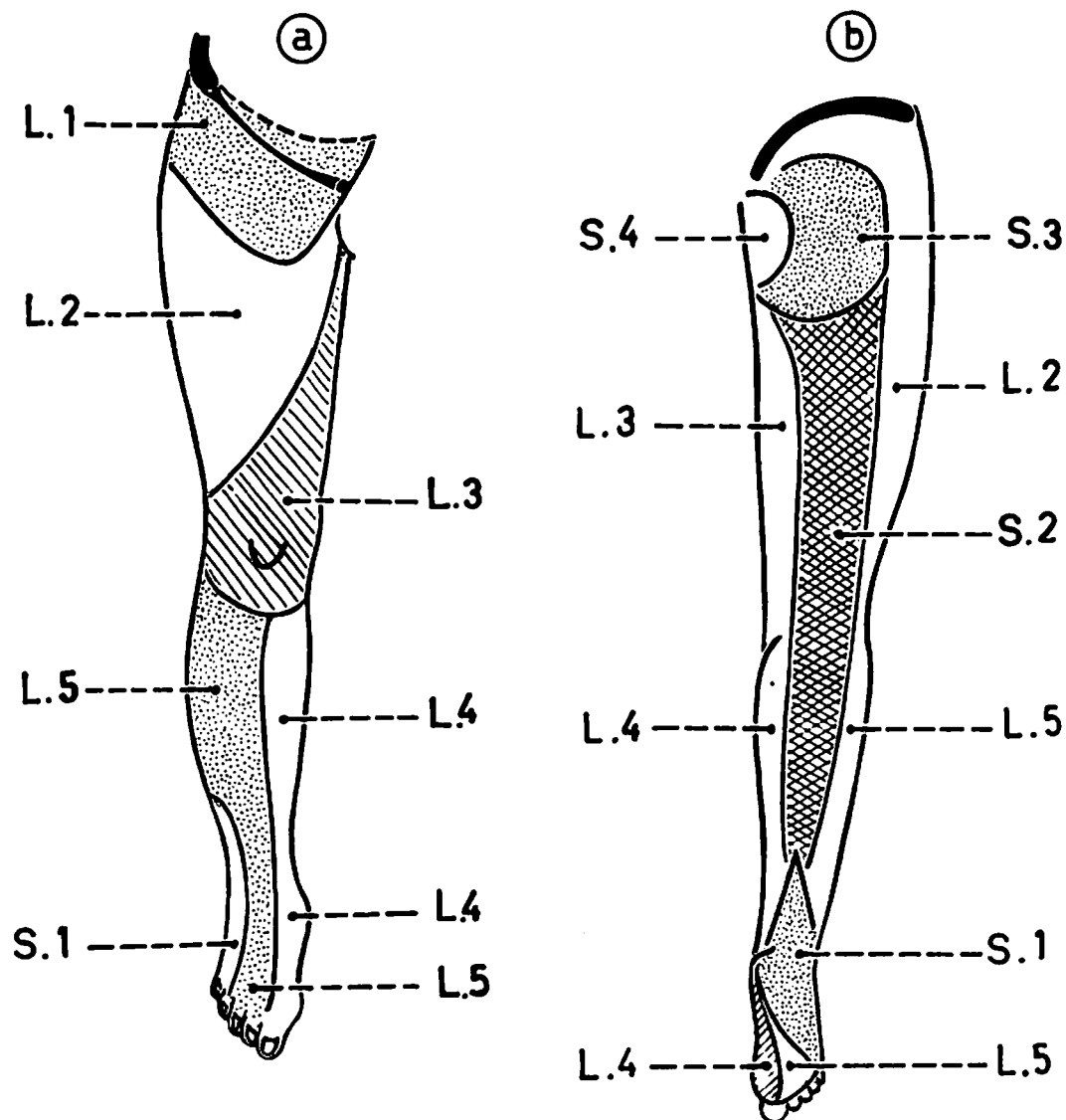


Fig.(285): SEGMENTAL DISTRIBUTION OF LUMBAR AND SACRAL NERVES TO THE SKIN OF LOWER LIMB

- (a) Anterior surface.
(b) Posterior surface.

** Segmental distribution of nerves means that each spinal nerve supplies a specific segment of skin of the lower limb; this segment of skin is also called a dermatome.

** Note that the front and sides of the limb are supplied mainly by lumbar nerves (L.1 to L.5), while the median area of the back of the limb is supplied by sacral nerves (S.1 to S.4).

JOINTS

HIP JOINT

Fig.(286): ACETABULUM

It forms the socket of the hip joint. Its margin is deficient below at the acetabular notch which is completed by the transverse ligament of acetabulum. A rim of fibrocartilage called labrum acetabulare is attached to the margin of acetabulum to increase its depth.

1. line of attachment of the fibrous capsule.
2. labrum acetabulare.
3. articular surface (lunate surface).
4. non-articular area (filled with a pad of fat).
5. transverse acetabular ligament (bridges over the acetabular notch).

* The hip joint is synovial of the ball-and-socket variety. It is formed by the acetabulum and the head of femur.

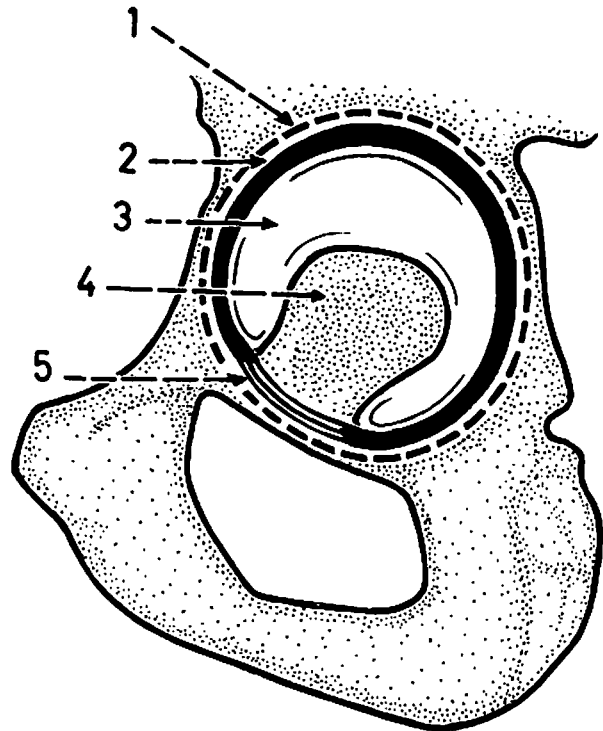
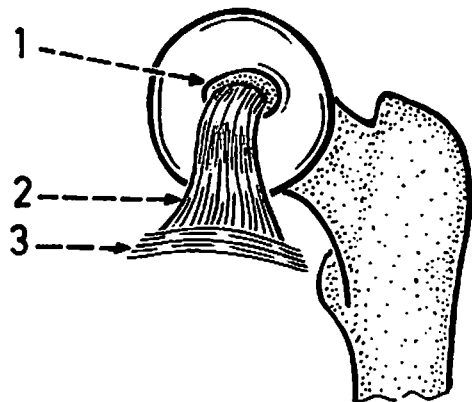


Fig.(287): HEAD OF FEMUR

It forms the distal articular surface of the hip joint (ball-like). It forms more than 1/2 a sphere and fits closely inside the acetabulum.

1. fovea (pit) on the head of femur.
2. ligament of the head of femur (extends from the fovea on the head of femur to the transverse acetabular ligament and the margins of the acetabular notch).
3. transverse acetabular ligament (bridges over the acetabular notch).



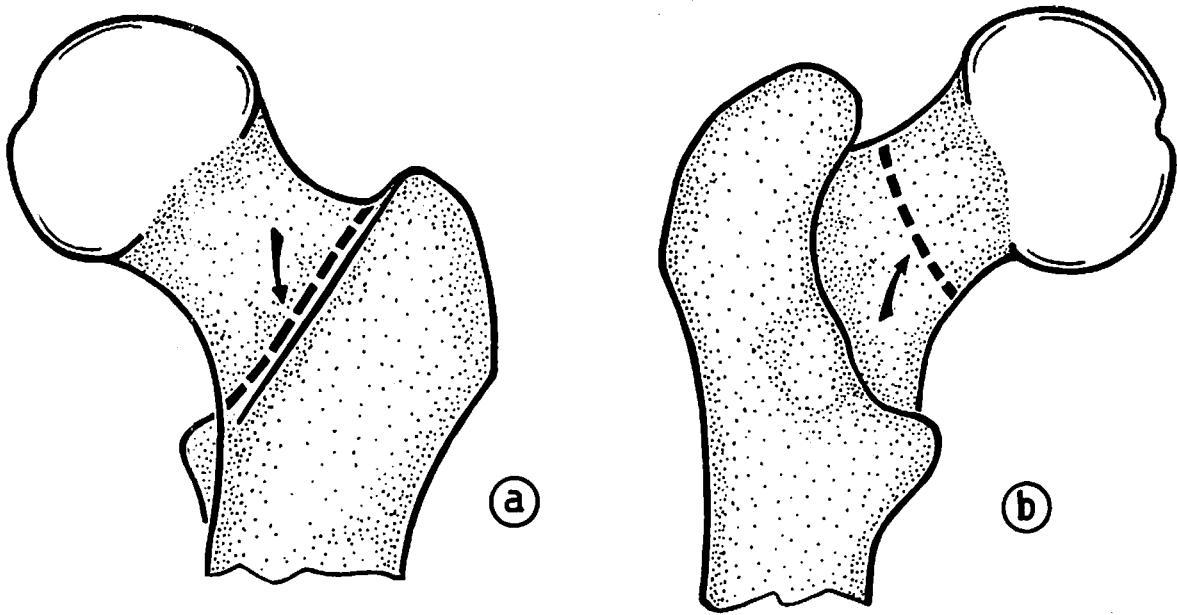


Fig.(288): ATTACHMENT OF FIBROUS CAPSULE OF HIP JOINT TO THE NECK OF FEMUR

- (a) Attachment to the front of neck: at the intertrochanteric line (the anterior surface of the neck is intracapsular).
- (b) Attachment to the back of neck: to the middle of the back of the neck (the lateral 1/2 of the back of the neck is extracapsular while the medial 1/2 is intracapsular).

Fig.(289): FIBROUS CAPSULE OF HIP JOINT

It is attached proximally to the margin of acetabulum and to the transverse acetabular ligament and distally to the neck of femur. Its anterior part is perforated.

- 1. proximal attachment of the capsule.
- 2. perforation in the anterior part of the capsule through which a communication is established between the joint cavity and the bursa under cover of iliopsoas.
- 3. fibrous capsule.
- 4. distal attachment of the capsule.

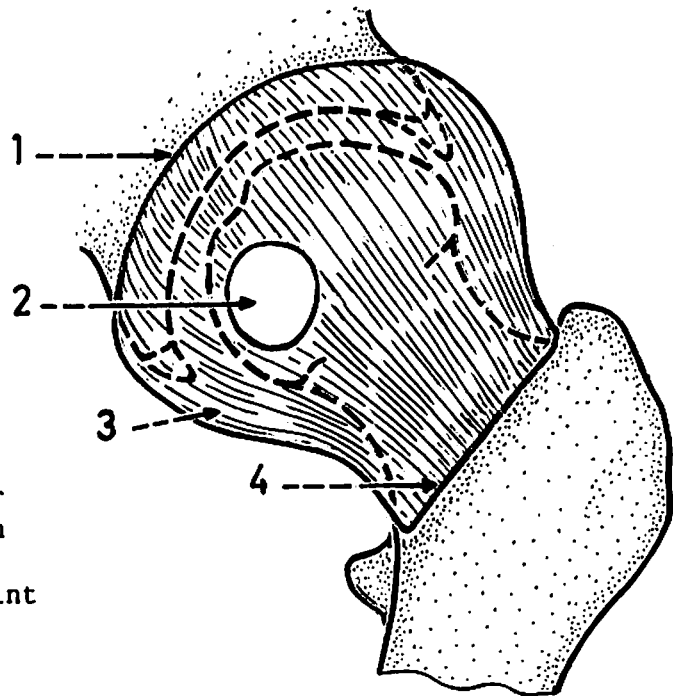


Fig.(290): ARRANGEMENT OF THE FIBRES OF THE CAPSULE

Most of the fibres of the capsule run obliquely from the acetabulum to the neck of femur, while some fibres are arranged circularly deep to the oblique fibres and are called zona orbicularis. The zona orbicularis winds round the neck of femur like a ring.

1. labrum acetabulare (in section).
2. longitudinal fibres of the capsule.
3. cut ends of the zona orbicularis.

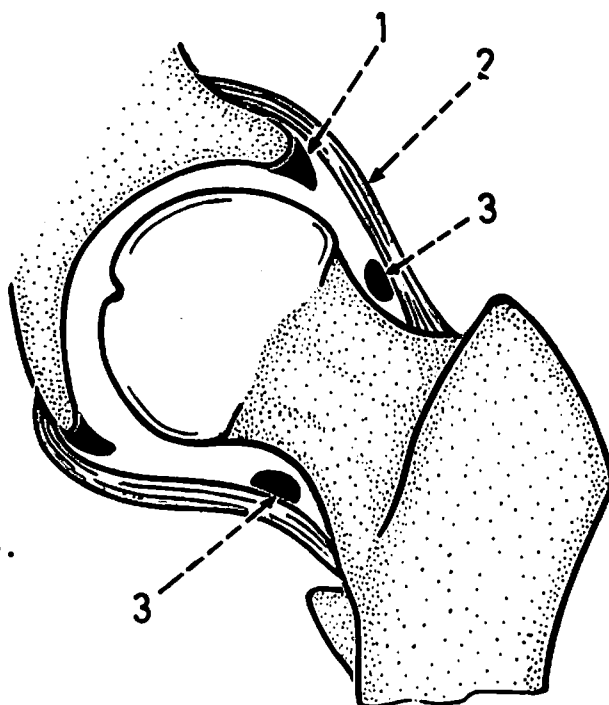


Fig.(291): ZONA ORBICULARIS

It is a circular band of fibres that encircles the neck of femur deep to the superficial longitudinal fibres of the capsule.

1. longitudinal fibres of the capsule.
2. zona orbicularis (cut).

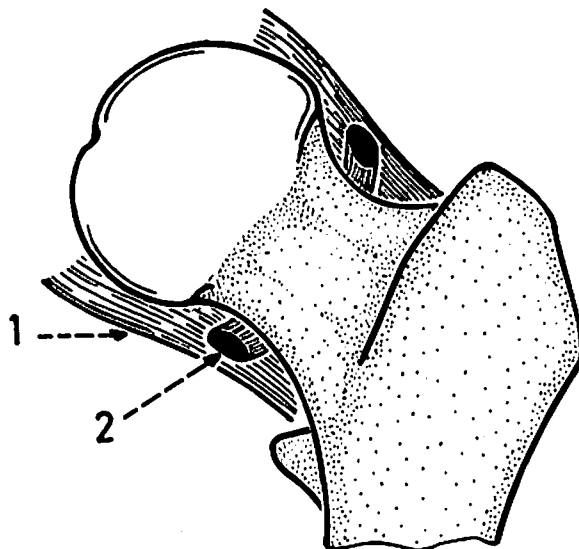


Fig.(292): RETINACULA OF THE NECK OF FEMUR

These are longitudinal bands which are reflected from the distal attachment of the fibrous capsule onto the neck of femur.

1. synovial membrane of hip joint.
2. fibrous capsule.
3. retinacula extending upwards along the neck of femur.

* Along these retinacula slender arteries reach the head and neck of femur.

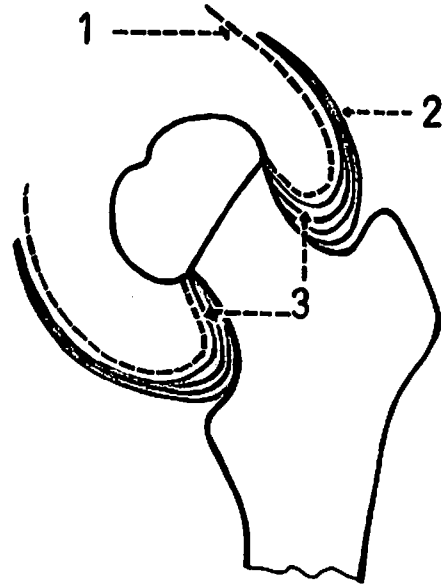


Fig.(293): IMPORTANCE OF RETINACULA IN FRACTURE NECK OF FEMUR

In fracture neck of femur the retinacula help to retain the fractured segments of the bone in place.

1. fracture neck of femur.
2. retinacula keeping the 2 segments in place.

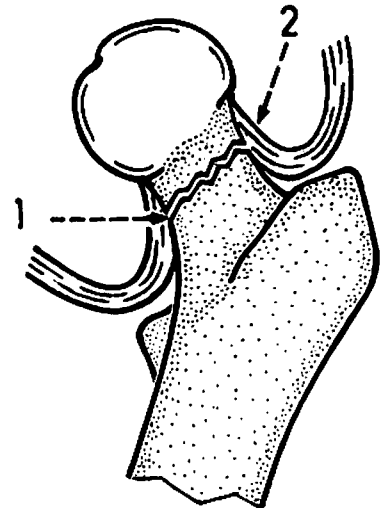


Fig.(294): ILIOFEMORAL AND PUBOFEMORAL LIGAMENTS OF HIP JOINT

The iliofemoral ligament lies on the front of the capsule and is the strongest ligament as it prevents hyperextension of the hip joint.

The pubofemoral ligament lies on the medial side of the capsule.

1. proximal attachment of iliofemoral ligament (to anterior inferior iliac spine).
2. gap between iliofemoral and pubofemoral ligaments through which the bursa beneath the iliopsoas communicates with the cavity of the hip joint.
3. proximal attachment of pubofemoral ligament (to iliopectic eminence).
4. medial band of iliofemoral ligament (to lower part of intertrochanteric line).
5. lateral band of iliofemoral ligament (to upper part of intertrochanteric line).

* The iliofemoral ligament is Y-shaped with its stem attached to the anterior inferior iliac spine and its 2 bands attached to the intertrochanteric line.

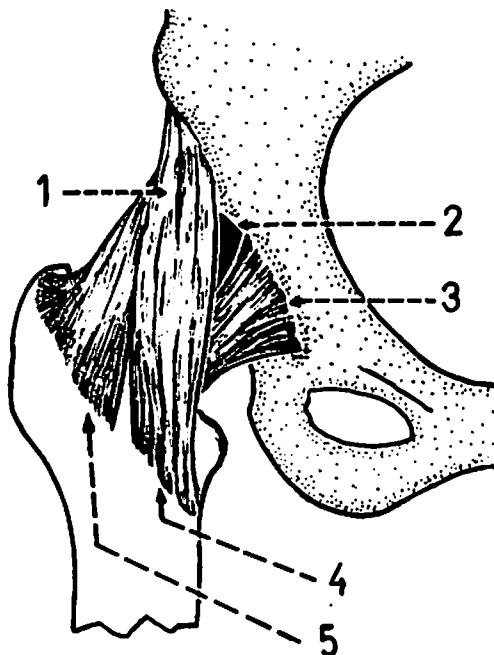


Fig.(295): ISCHIOFEMORAL LIGAMENT OF HIP JOINT

It is a weak ligament which lies on the back of the capsule. It arises from the ischium just below the acetabulum and its fibres run obliquely upwards and laterally.

1. ischiofemoral ligament.
2. tendon of obturator externus (on the lateral 1/2 of the back of neck of femur).

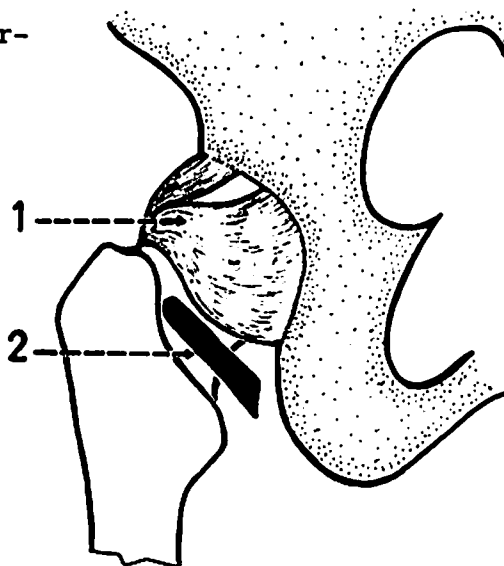


Fig.(296): CAVITY OF HIP JOINT

1. labrum acetabulare (intracapsular).
2. ligament of the head of femur (intracapsular).
3. fibrous capsule.
4. cavity of the joint.

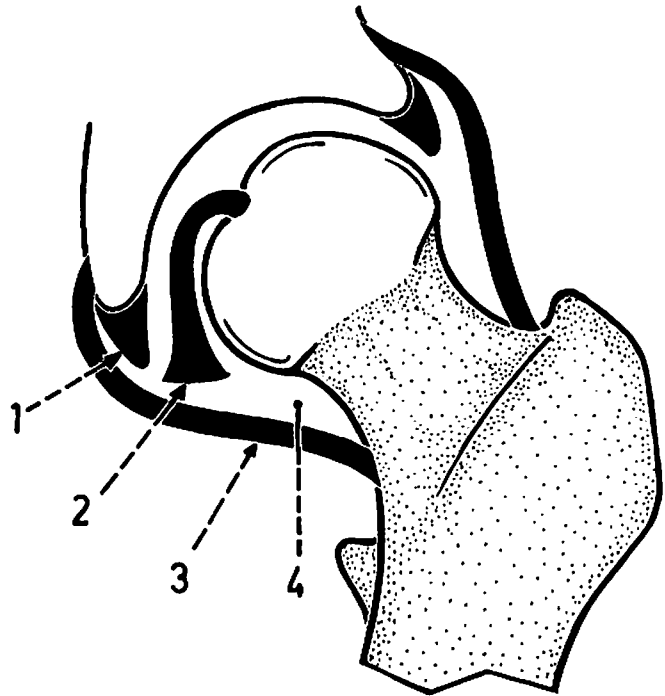
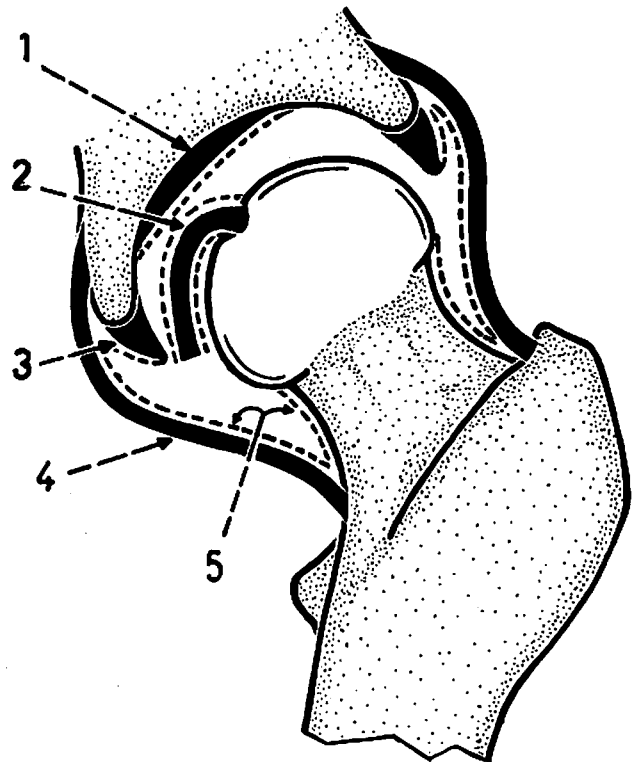


Fig.(297): SYNOVIAL MEMBRANE OF HIP JOINT

It lines the fibrous capsule and is reflected onto the following structures: neck of femur, ligament of head of femur, labrum acetabulare and the pad of fat in the depth of the acetabulum (all these structures are intracapsular).

1. pad of fat in the depth of acetabulum.
2. ligament of head of femur.
3. labrum acetabulare.
4. fibrous capsule.
5. synovial membrane.



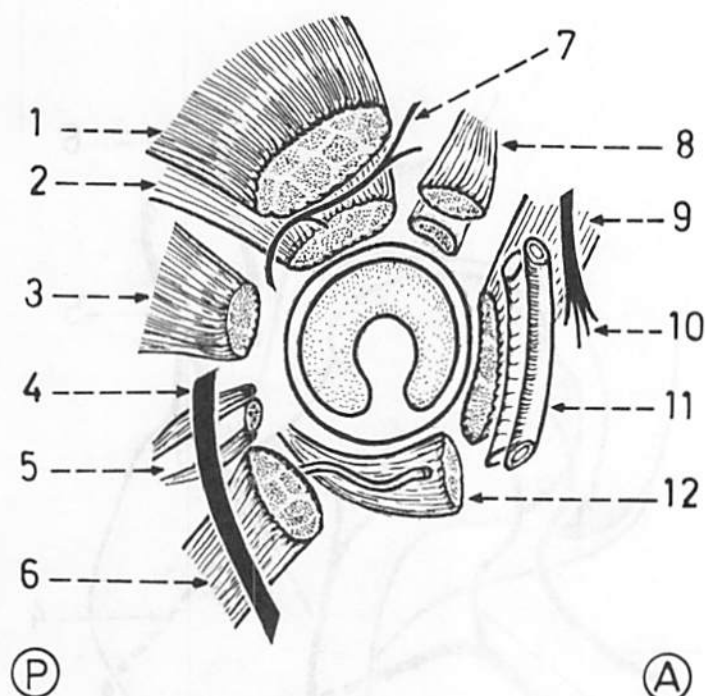


Fig.(298): RELATIONS OF THE HIP JOINT

1. gluteus medius (above).
2. gluteus minimus (above).
3. piriformis (behind).
4. sciatic nerve (separated from the joint by muscles).
5. tendon of obturator internus and the 2 gemelli (behind).
6. quadratus femoris (behind).
7. superior gluteal nerve (between gluteus medius and minimus).
8. straight head of rectus femoris and iliofemoral ligament (above).
9. iliopsoas muscle (in front).
10. femoral nerve.
11. femoral vessels (separated from the joint by iliopsoas).
12. obturator externus and medial circumflex femoral artery (below).

- * The sciatic nerve is the most important posterior relation, while the femoral artery is the most important anterior relation.
- * The sciatic nerve may be injured in posterior dislocation of the hip joint.
- * The hip joint is surrounded from all sides by strong muscles which play an important role in its stability.

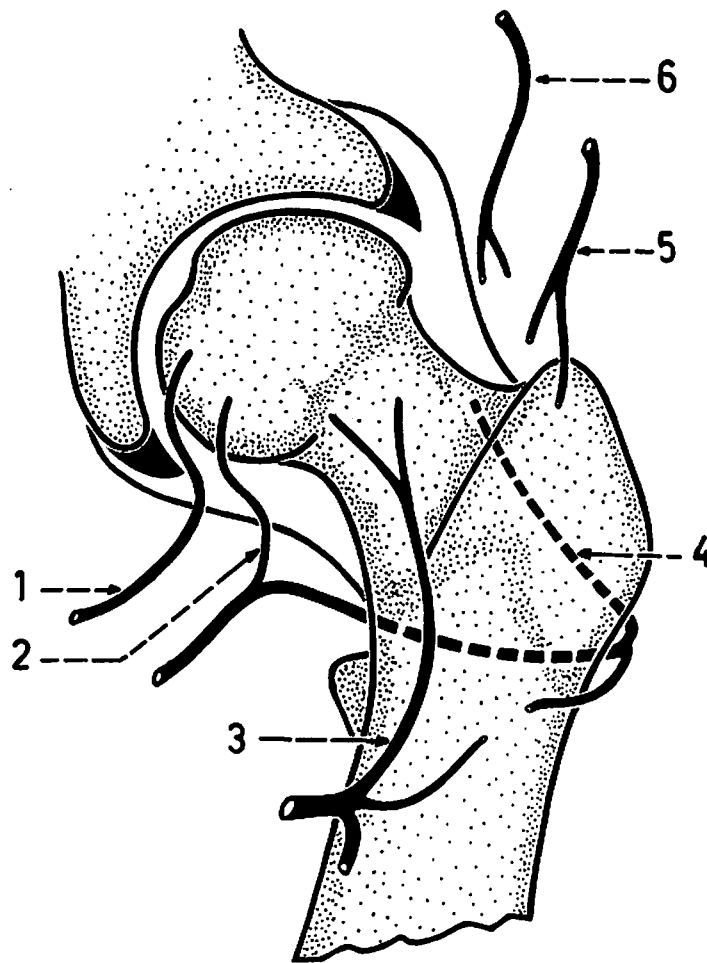


Fig.(299): ANASTOMOSIS AROUND THE HIP JOINT

The arteries sharing in the anastomosis around the hip joint are derived from the profunda femoris (of femoral), obturator (of internal iliac) and the 2 gluteal arteries (of internal iliac).

1. acetabular branch of obturator artery (enters the joint).
2. acetabular branch of medial circumflex femoral (enters the joint).
3. ascending branch of lateral circumflex femoral artery.
4. ascending branch of medial circumflex femoral artery.
5. inferior gluteal artery.
6. superior gluteal artery.

Fig.(300): NELATON'S LINE

It is the line passing between the anterior superior iliac spine and the most prominent point of ischial tuberosity. It passes through the tip of greater trochanter and is used in testing deformity of the hip joint.

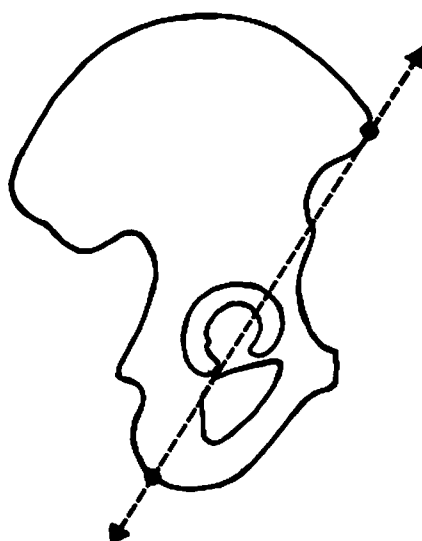


Fig.(301): SHENTON'S LINE

Normally, the upper border of obturator foramen forms a smooth curved line with the lower margin of the neck of femur. This curved line is called Shenton's line and is demonstrated only in an X-ray picture; it is disturbed in fracture neck of femur.

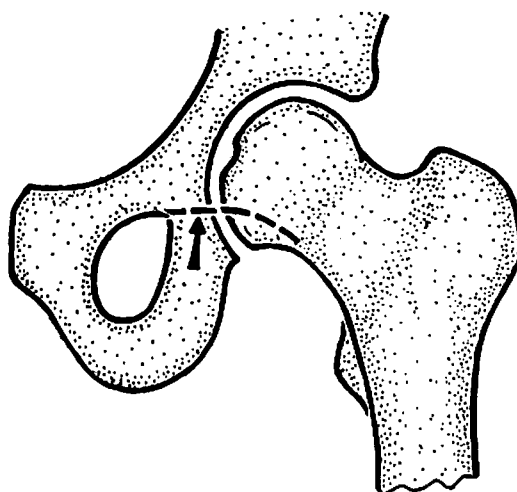


Fig.(302): RELATION BETWEEN THE TOP OF GREATER TROCHANTER AND CENTRE OF THE HEAD OF FEMUR

Normally the top of greater trochanter, centre of head of femur and centre of acetabulum on both sides lie on the same transverse line. This relation is disturbed in fracture neck of femur or dislocation of the hip.

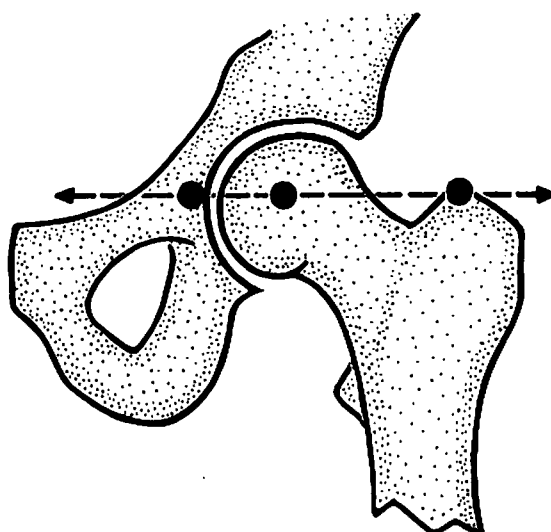


Fig.(303): BRYANT'S TRIANGLE

This triangle is bounded by 3 lines:

1. line from anterior superior iliac spine to top of greater trochanter.
2. horizontal line drawn from the anterior superior iliac spine.
3. vertical line from the horizontal line (2) to the top of greater trochanter.

* The line (3) is used to test upward displacement of greater trochanter, while line (1) is used to test its backward displacement.

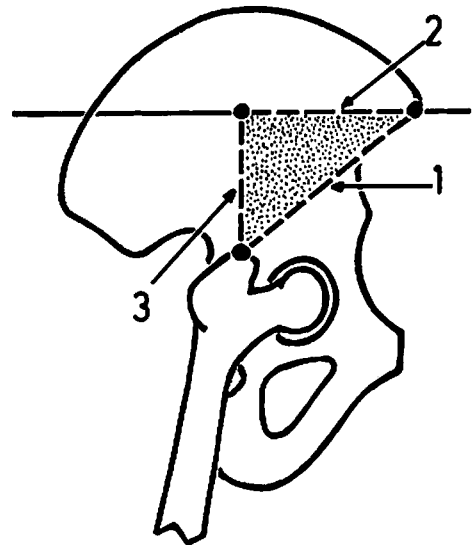
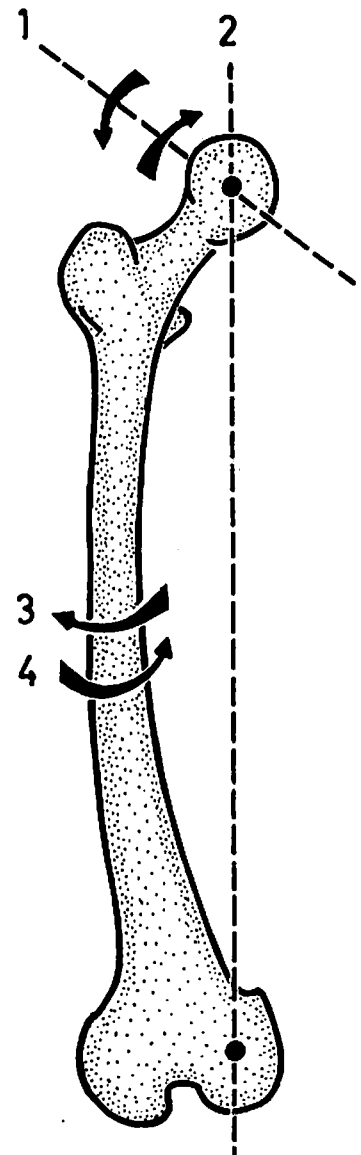


Fig.(304): AXES OF MOVEMENTS OF HIP JOINT

1. horizontal axis: it passes horizontally through the centre of the head of femur; for flexion and extension of the hip joint.
2. Vertical axis: it passes vertically from the centre of the head of femur to the centre of the medial condyle of femur; for medial and lateral rotation.
3. lateral rotation.
4. medial rotation.



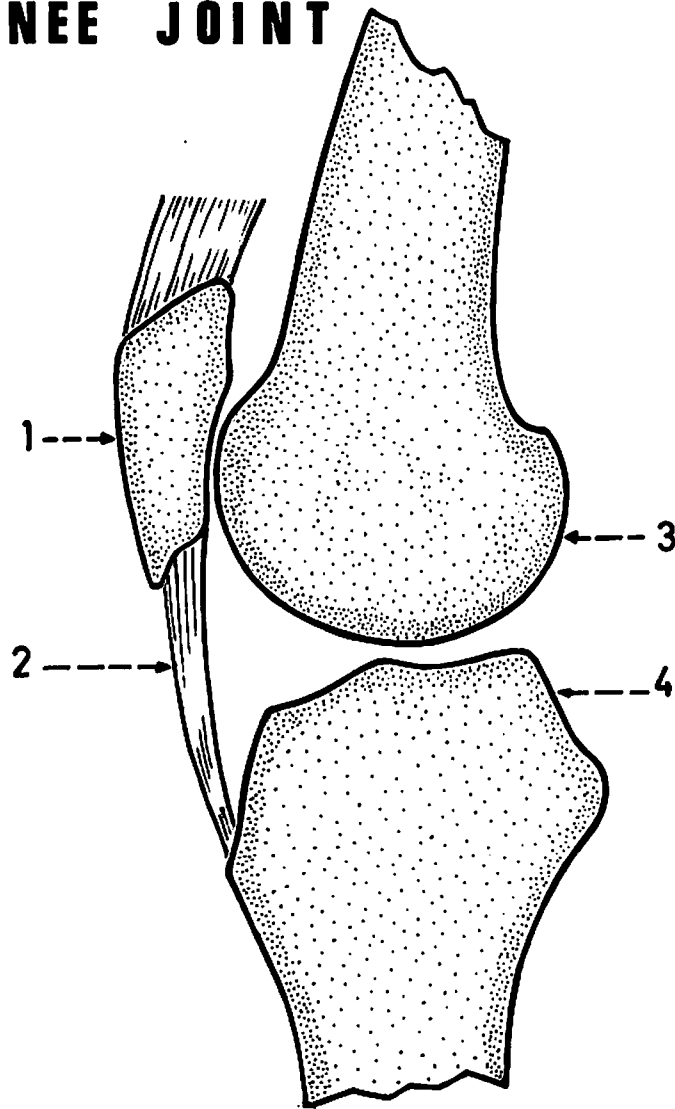


Fig.(305): ARTICULATING BONES OF KNEE JOINT

These are the 2 femoral condyles, the 2 tibial condyles and the patella. The articular surfaces are large and incongruent, i.e. not exactly fitting.

1. patella (in front).
2. ligamentum patellae (from the patella to the tibial tuberosity).
3. femoral condyle (above).
4. tibial condyle (below).

* The knee joint is a synovial joint of the condylar variety (modified hinge).

Fig.(306): CAPSULAR ATTACHMENT TO THE
OF FEMORAL CONDYLES
(anteriorly)

The fibrous capsule is deficient anteriorly and is not attached to the front of the femoral condyles where it is replaced by the lower part of the quadriceps femoris, patella and ligamentum patellae (from above downwards).

1. gap in the capsular attachment to the front of femoral condyles (allows for communication between cavity of the joint and suprapatellar bursa).
2. attachment of the capsule to the sides of femoral condyles.

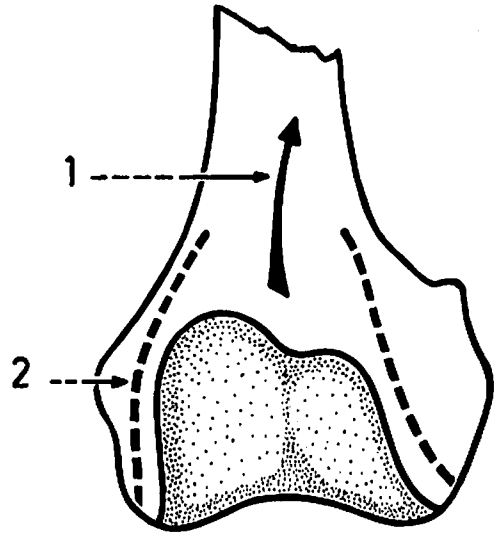


Fig.(307): ANTERIOR DEFICIENCY IN
THE FIBROUS CAPSULE

The deficient anterior part of the fibrous capsule is replaced by the lower part of quadriceps femoris, patella and ligamentum patellae.

1. lower part of quadriceps femoris.
2. patella.
3. ligamentum patellae.
4. back of fibrous capsule.
5. deficiency in anterior part of the capsule.

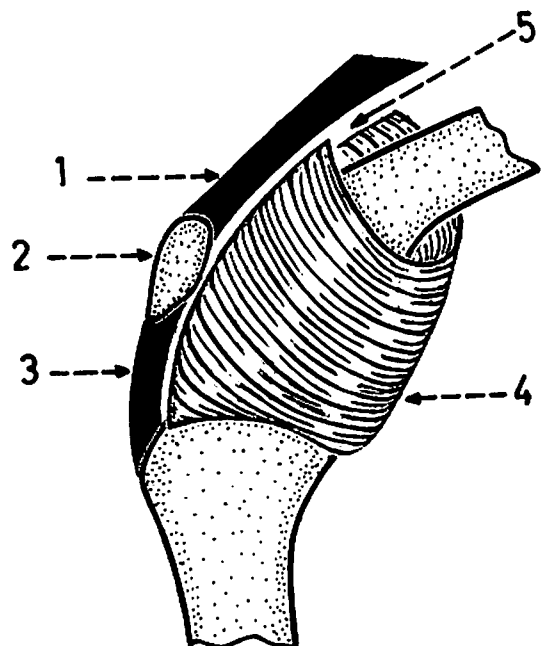


Fig.(308): CAPSULAR ATTACHMENT TO
THE FEMORAL CONDYLES
(laterally)

The capsule is attached to the side of the condyle very close to the articular surface but it lies just above the groove for the tendon of popliteus. This groove is therefore intracapsular while the lateral epicondyle is extracapsular.

1. lateral epicondyle (extracapsular).
2. groove for popliteus (intracapsular).
3. capsular attachment.

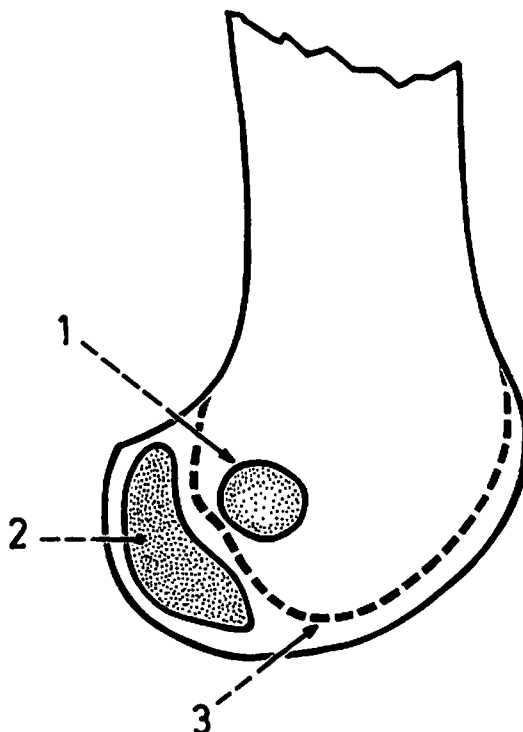


Fig.(309): CAPSULAR ATTACHMENT TO THE
FEMORAL CONDYLES
(posteriorly)

The capsule is attached close to the articular surfaces of the 2 condyles as well as to the posterior margin of the intercondylar fossa.

1. capsular attachment.
2. intercondylar fossa.

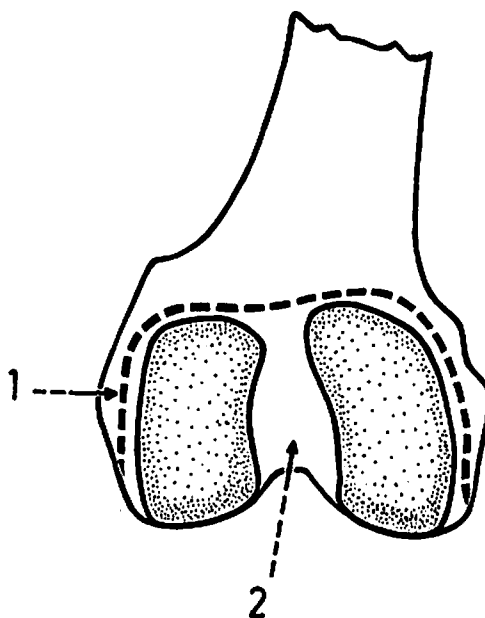


Fig.(310): CAPSULAR ATTACHMENT TO
THE TIBIAL CONDYLES
(anteriorly)

The capsule is attached close to the articular surfaces of the 2 tibial condyles and descends along the sides of the tibial tuberosity on each side of the ligamentum patellae.

1. capsular attachment along the side of tibial tuberosity.
2. upper part of tibial tuberosity.
3. lower part of tibial tuberosity (subcutaneous part).

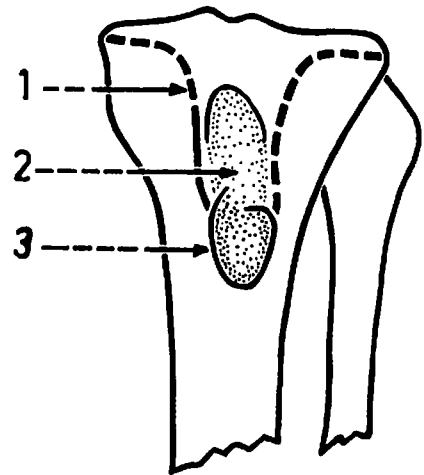


Fig.(311): CAPSULAR ATTACHMENT TO
THE TIBIAL CONDYLES
(posteriorly)

The capsule is attached close to the articular surfaces of the 2 condyles, but it is deficient behind the lateral condyle to allow for the tendon of popliteus to emerge from inside the cavity of the joint.

1. deficiency for the tendon of popliteus.
2. capsular attachment.

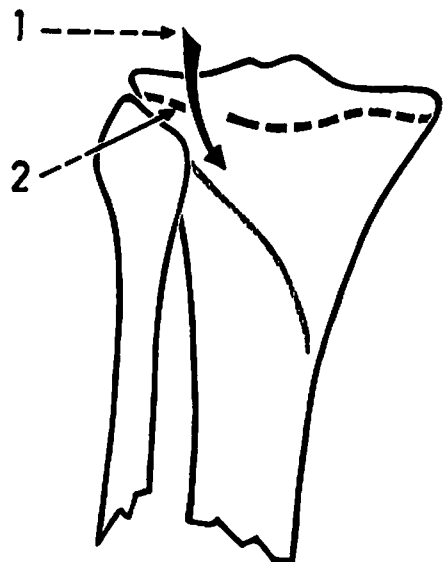


Fig.(312): BACK OF THE CAPSULE
OF KNEE JOINT

The capsule of knee joint is perforated at 2 sites posteriorly: one behind the lateral condyle of tibia for the tendon of popliteus, and one behind the medial condyle of femur where the cavity of the joint communicates with the bursa deep to the medial head of gastrocnemius.

1. perforation for the bursa deep to medial head of gastrocnemius (a constant bursa).
2. back of fibrous capsule.
3. tendon of popliteus.
4. arcuate ligament (arches over the tendon of popliteus).

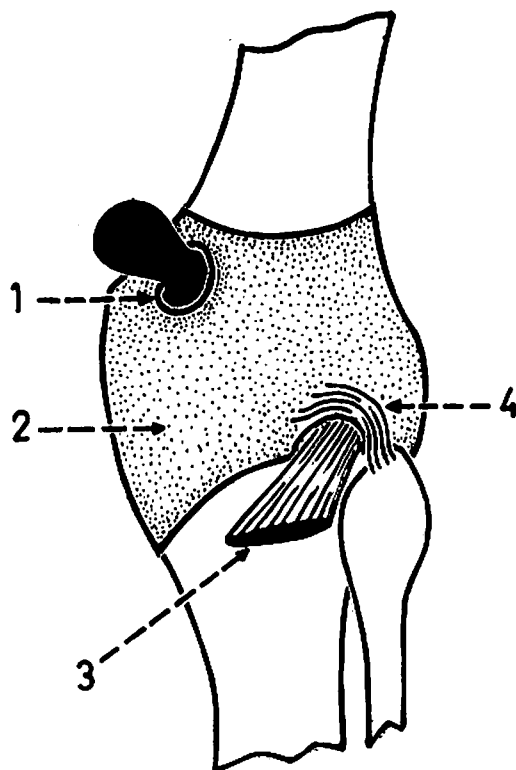


Fig.(313): UPWARD EXTENSION OF
SYNOVIAL MEMBRANE
(SUPRAPATELLAR BURSA)

The synovial membrane lines the fibrous capsule and extends upwards for a hand's breadth above the patella to form the suprapatellar bursa. This bursa lies between the quadriceps femoris and lower part of the front of femur.

1. origin of articularis genu.
2. upward extension of synovial membrane to form the suprapatellar bursa.
3. fibrous capsule (deficient).

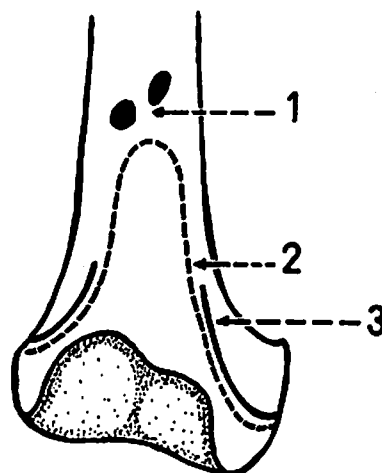


Fig.(314): EXTENSIONS OF SYNOVIAL MEMBRANE OF KNEE JOINT

The synovial membrane of knee joint extends upwards above the patella to form the suprapatellar bursa, and downwards below the patella over the infrapatellar pad of fat to form the infrapatellar fold.

1. articularis genu muscle (arises from the femur and is inserted into the suprapatellar bursa).
2. suprapatellar bursa.
3. quadriceps femoris.
4. patella.
5. ligamentum patellae.
6. infrapatellar pad of fat covered by synovial membrane (this synovial membrane is called infrapatellar fold which extends backwards to the intercondylar fossa).
7. backward extension of the infrapatellar fold to the intercondylar fossa.

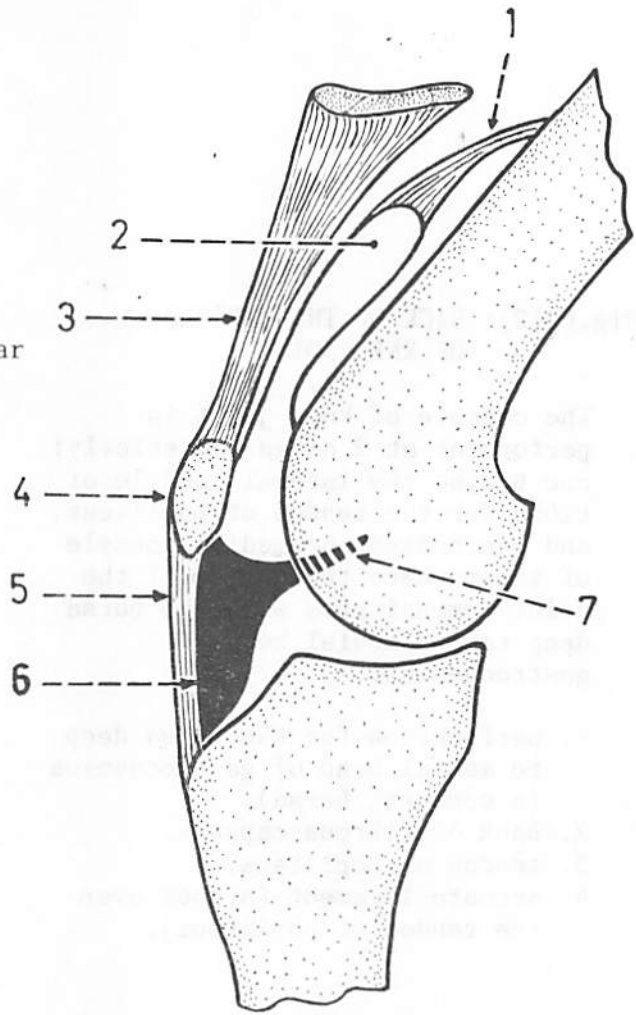


Fig.(315): INFRAPATELLAR FOLD

This is a fold of synovial membrane which covers the infrapatellar pad of fat and extends backwards to the intercondylar fossa of the femur. The sides of the infrapatellar fold project to some extent to form the alar folds.

1. infrapatellar fold.
2. back of patella.
3. quadriceps tendon (reflected).
4. intercondylar fossa.
5. alar fold.

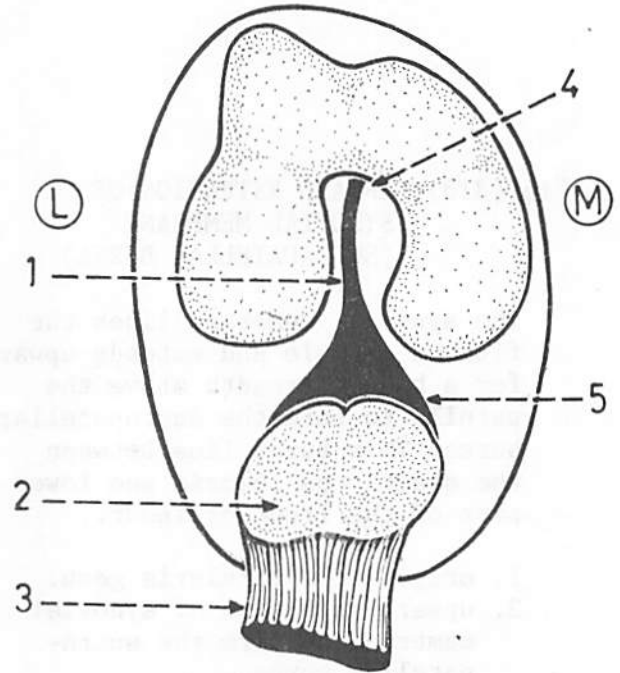


Fig.(316): BURSAE RELATED TO
KNEE JOINT
(ON THE FRONT)

There are 4 bursae on the front of knee joint: suprapatellar, prepatellar, deep infrapatellar and subcutaneous infrapatellar bursae.

1. quadriceps femoris.
2. suprapatellar bursa (above the patella).
3. prepatellar bursa (in front of the patella).
4. deep infrapatellar bursa (deep to the ligamentum patellae).
5. ligamentum patellae.
6. subcutaneous infrapatellar bursa (superficial to the tuberosity of tibia).
7. articularis genu muscle.

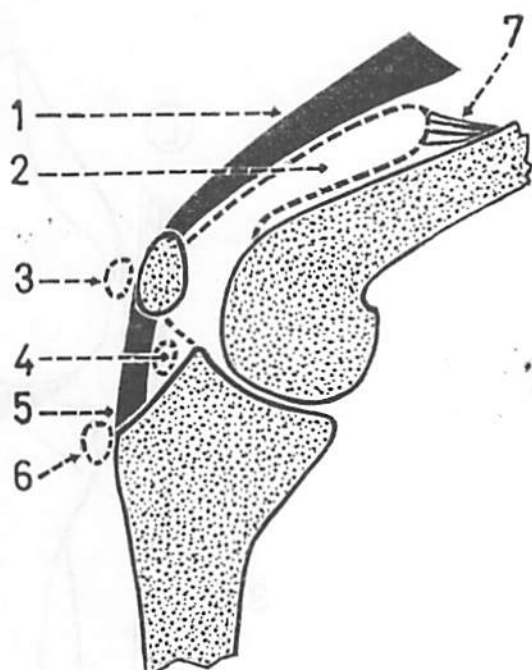
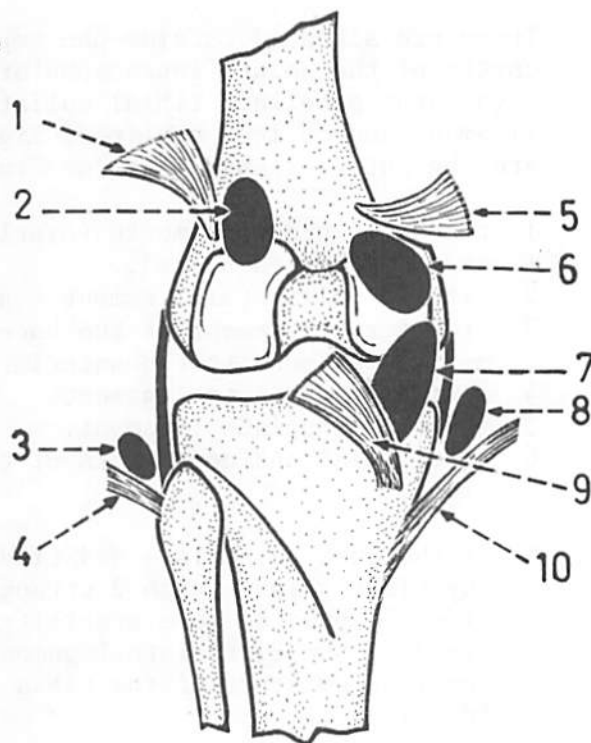


Fig.(317): BURSAE RELATED TO KNEE JOINT
(ON BACK AND SIDES)

Many bursae lie on the back of knee joint and are divided into lateral and medial groups. The lateral group includes mainly one deep to lateral head of gastrocnemius and one deep to the tendon of biceps femoris. The medial group includes mainly one deep to medial head of gastrocnemius, one deep to tendon of semimembranosus and one superficial to tibial collateral ligament.

1. lateral head of gastrocnemius.
2. bursa deep to lateral head of gastrocnemius.
3. bursa deep to biceps femoris.
4. tendon of biceps femoris.
5. medial head of gastrocnemius.
6. bursa deep to medial head of gastrocnemius.
7. bursa deep to semimembranosus.
8. bursa superficial to tibial collateral ligament.
9. tendon of semimembranosus.
10. tendon of semitendinosus.



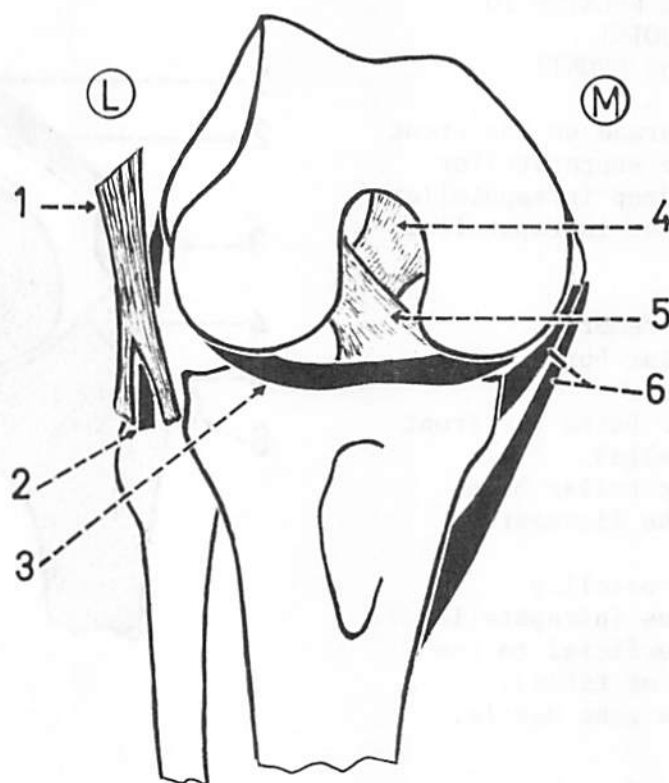


Fig.(318): LIGAMENTS OF KNEE JOINT

These are situated outside the capsule (extracapsular) or inside the cavity of the joint (intracapsular). The extracapsular ligaments are ligamentum patellae, tibial collateral ligament, fibular collateral ligament and oblique popliteal ligament. The intracapsular ligaments are the anterior and posterior cruciate ligaments.

1. tendon of biceps femoris (overlies the fibular collateral ligament and is splitted by it).
2. fibular collateral ligament (on lateral side).
3. transverse ligament of the knee (connects the anterior horn of medial meniscus to the anterior horn of lateral meniscus).
4. posterior cruciate ligament.
5. anterior cruciate ligament.
6. superficial and deep parts of tibial collateral ligament (on medial side).

* As the knee joint is a modified hinge joint it is provided - like any hinge joint - with 2 strong collateral ligaments, one on each side. To provide more stability to the joint, its central part is fixed by the 2 cruciate ligaments which extend from the intercondylar eminence of the tibia to the intercondylar fossa of the femur.

Fig.(319); TIBIAL COLLATERAL LIGAMENT

It lies on the medial side extending from the medial epicondyle of femur to the medial condyle of tibia as well as to the upper part of medial surface of tibia. It is fan-shaped and is adherent to the fibrous capsule. It has a superficial long part and a deep shorter part.

1. medial epicondyle of femur.
2. insertion of sartorius.
3. insertion of gracilis.
4. deep posterior part of tibial collateral ligament.
5. medial meniscus.
6. tendon of semimembranosus.
7. inferior medial genicular nerve and artery (deep to the ligament).
8. superficial anterior part of tibial collateral ligament.
9. insertion of semitendinosus (immediately in front of the ligament).

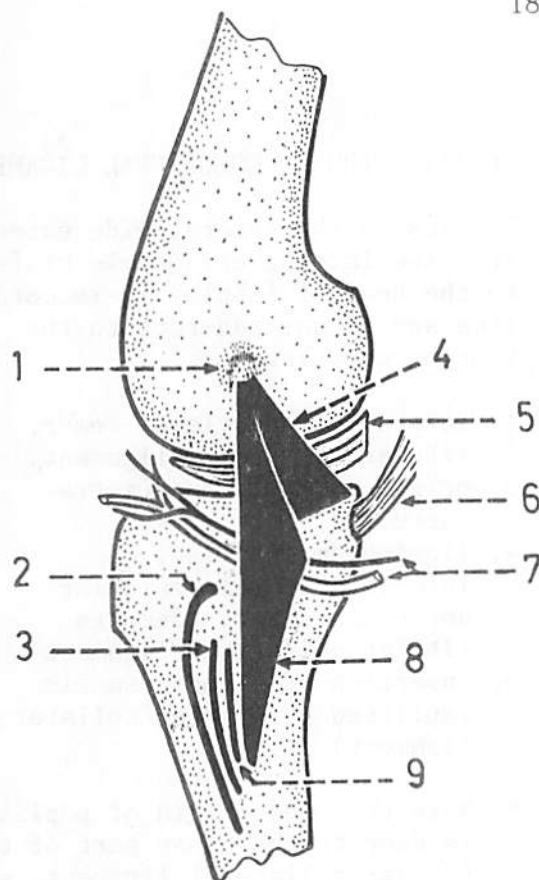


Fig.(320): MUSCLES SUPERFICIAL TO TIBIAL COLLATERAL LIGAMENT

The tibial collateral ligament is covered by the tendons of sartorius, gracilis and semitendinosus which cross over it to get inserted immediately in front of it. The ligament is separated from these 3 tendons by a bursa.

1. sartorius.
2. vastus medialis.
3. gracilis.
4. semitendinosus.
5. tibial collateral ligament.

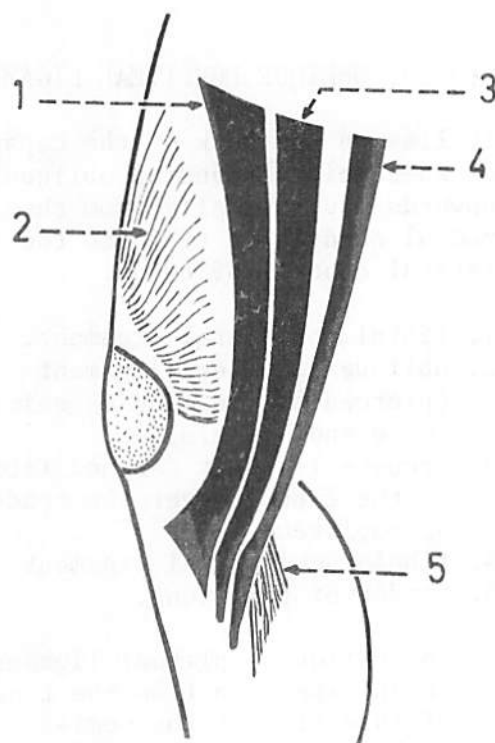
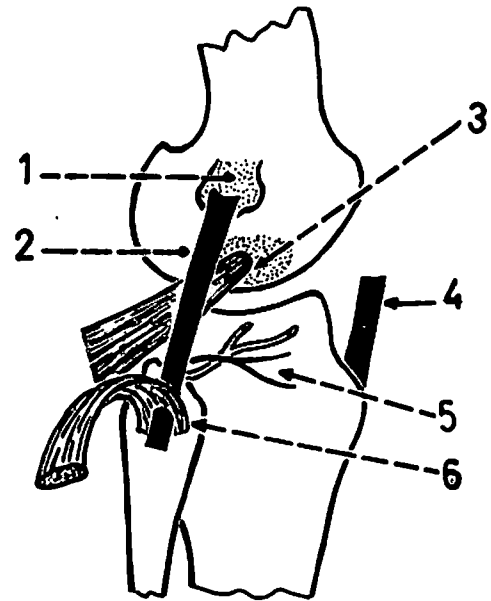


Fig.(321): FIBULAR COLLATERAL LIGAMENT

It lies on the lateral side extending from the lateral epicondyle of femur to the head of fibula. It is cord-like and is not adherent to the fibrous capsule.

1. lateral epicondyle of femur.
2. fibular collateral ligament.
3. origin of popliteus (intra-capsular).
4. ligamentum patellae.
5. inferior lateral genicular nerve and artery (deep to fibular collateral ligament).
6. insertion of biceps femoris (splitted by fibular collateral ligament).

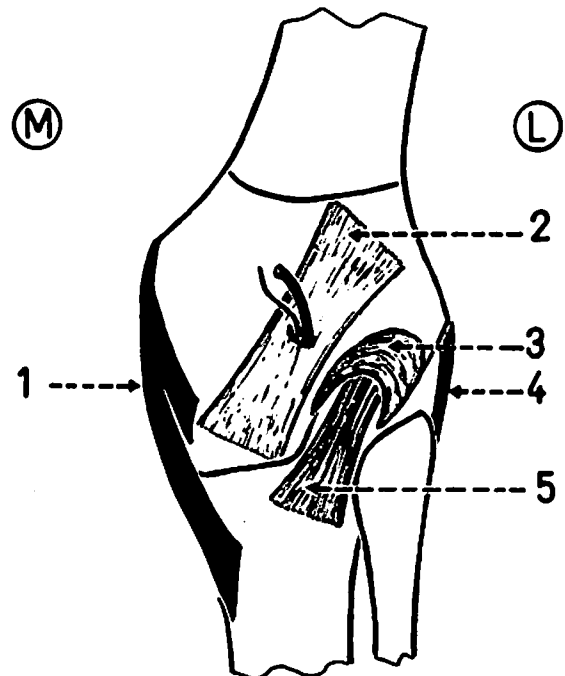


- * Note that the origin of popliteus is deep to the upper part of the fibular collateral ligament, while the insertion of biceps femoris is superficial to its lower part.

Fig.(322): OBLIQUE POPLITEAL LIGAMENT

It lies on the back of the capsule of knee joint extending obliquely upwards and laterally from the medial condyle of tibia to the lateral condyle of femur.

1. tibial collateral ligament.
2. oblique popliteal ligament (pierced by the middle genicular nerve and vessels).
3. arcuate ligament (arched fibres of the capsule over the tendon of popliteus).
4. fibular collateral ligament.
5. tendon of popliteus.



- * The oblique popliteal ligament is an expansion from the tendon of insertion of the semi-membranosus muscle.

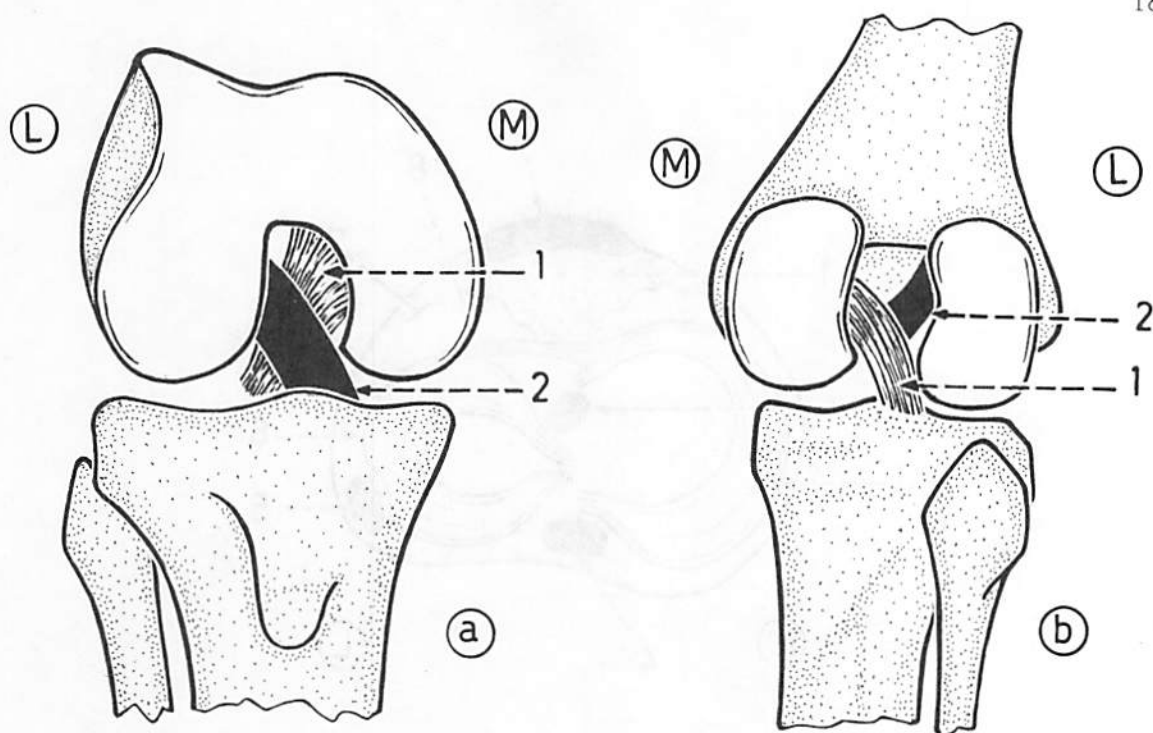


Fig.(323): CRUCIATE LIGAMENTS

These are anterior and posterior ligaments which lie inside the knee joint and cross each other like the letter "X". The anterior cruciate extends from the anterior part of the intercondylar area of tibia to the posterior part of the medial surface of lateral condyle of femur. The posterior cruciate extends from the most posterior part of the intercondylar area of tibia to the anterior part of the lateral surface of the medial condyle of femur.

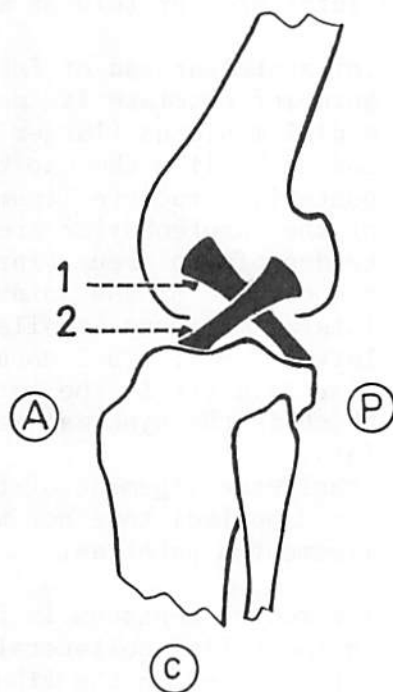
(a) anterior view.

(b) posterior view.

(c) lateral view.

1. posterior cruciate ligament.

2. anterior cruciate ligament.



* The anterior cruciate is taut in full extension of the knee, while the posterior cruciate is taut in full flexion.

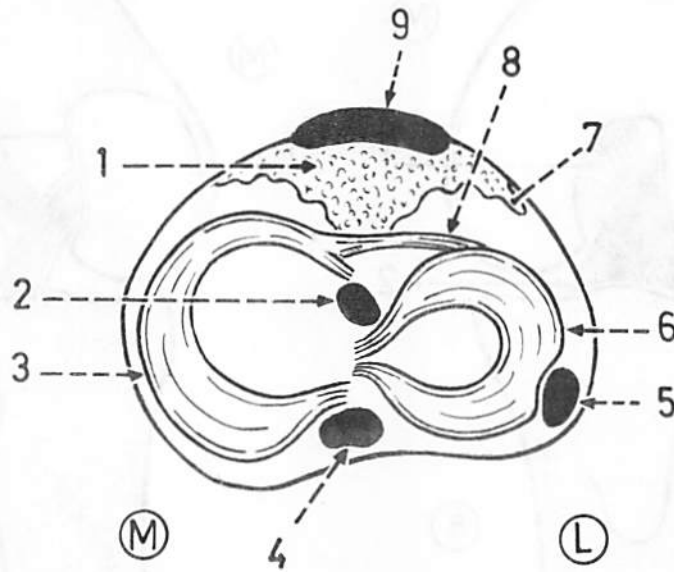


Fig.(324): STRUCTURES INSIDE THE KNEE JOINT

These structures are: 2 menisci, 2 cruciate ligaments, tendon of popliteus, transverse ligament of the knee, infrapatellar pad of fat and infrapatellar fold of synovial membrane.

1. infrapatellar pad of fat (immediately behind ligamentum patellae).
2. anterior cruciate ligament.
3. medial meniscus (larger and less circular than the lateral meniscus and looks like the capital letter " C ").
4. posterior cruciate ligament (attached to the most posterior part of the intercondylar area of the tibia).
5. tendon of popliteus (interposed between the lateral meniscus and the capsule of the joint).
6. lateral meniscus (smaller and more circular and looks like the letter " o "; its 2 horns are attached very close to each other).
7. alar fold (it is the lateral extension of the infrapatellar fold which is the synovial membrane covering the infrapatellar pad of fat).
8. transverse ligament of the knee (connects the anterior horns of the 2 menisci together with no bony attachment).
9. ligamentum patellae.

* The medial meniscus is firmly adherent to the capsule as well as to the tibial collateral ligament, while the lateral meniscus is not attached to the fibular collateral ligament. Therefore, the lateral meniscus is more mobile than the medial meniscus.

Fig.(325): RELATION OF THE MENISCI
TO THE COLLATERAL LIGAMENTS

The medial meniscus is firmly adherent to the tibial collateral ligament, while the lateral meniscus is separated from the fibular collateral ligament by the tendon of popliteus (more mobile).

1. fibular collateral ligament (not adherent to the capsule).
2. lateral meniscus (separated from the capsule by the tendon of popliteus which is marked by arrow).
3. tibial collateral ligament.
4. medial meniscus.

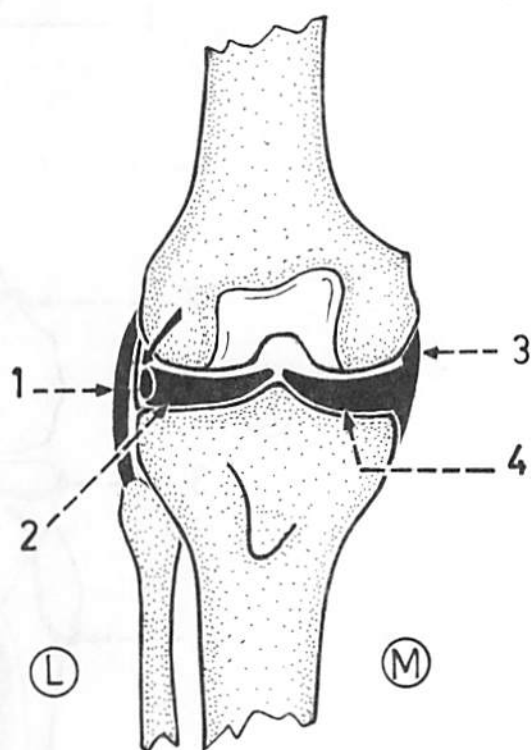
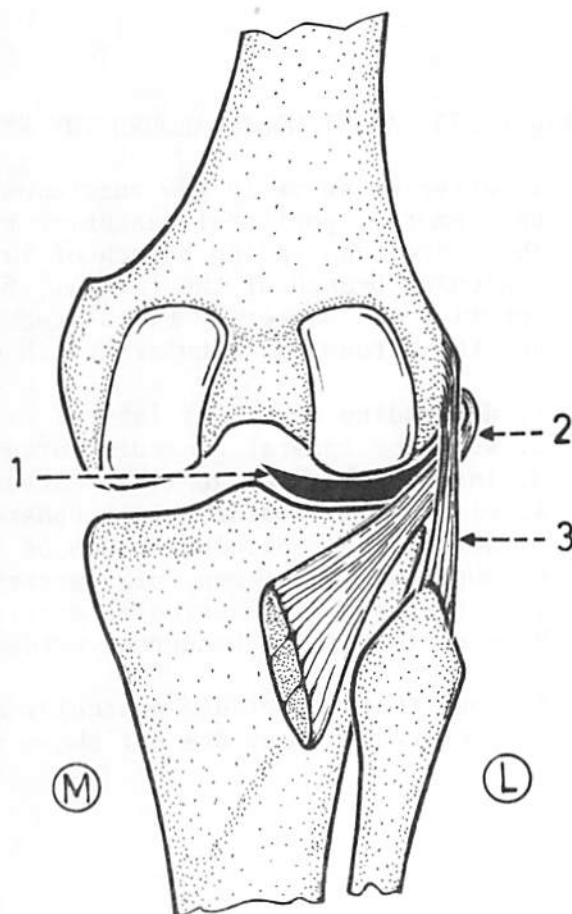


Fig.(326): RELATION OF THE LATERAL
MENISCUS TO THE TENDON
OF POPLITEUS
(posterior view)

The tendon of popliteus intervenes between the lateral meniscus and the fibular collateral ligament. At this site it is attached to the meniscus and thus it pulls on it as the muscle contracts.

1. lateral meniscus.
2. tendon of popliteus.
3. fibular collateral ligament.



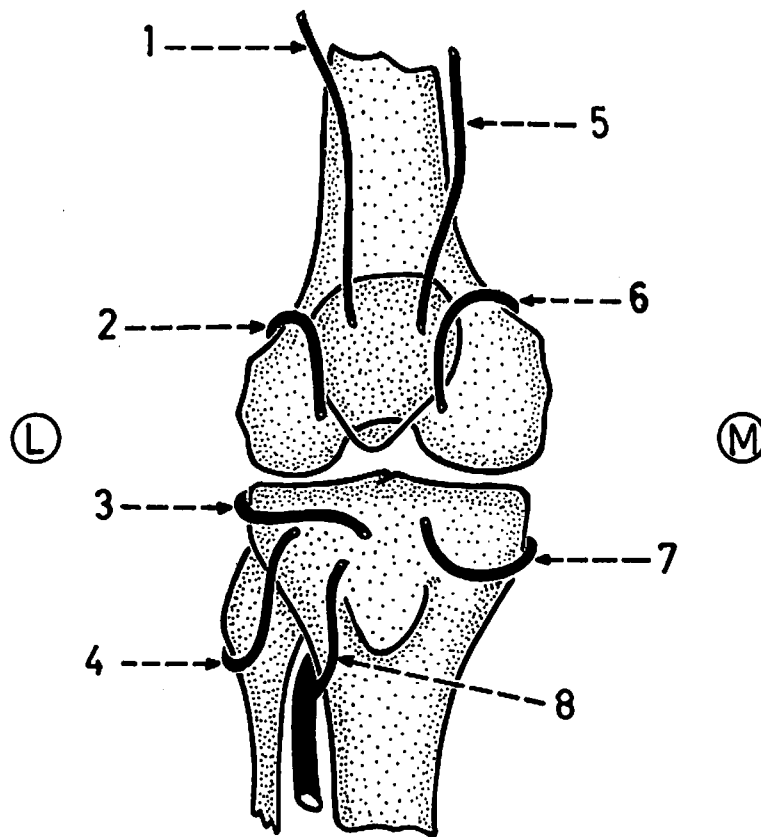


Fig.(327): ANASTOMOSIS AROUND THE KNEE

10 arteries share in the anastomosis around the knee and are derived from the femoral, popliteal, anterior tibial and posterior tibial arteries. These are: descending branch of lateral circumflex femoral, descending genicular branch of the femoral, 5 genicular branches of the popliteal, anterior and posterior tibial recurrent branches of the anterior tibial and the circumflex fibular branch of the posterior tibial artery.

1. descending branch of lateral circumflex femoral (profunda femoris).
2. superior lateral genicular artery (popliteal).
3. inferior lateral genicular artery (popliteal).
4. circumflex fibular artery (posterior tibial).
5. descending genicular branch of femoral artery.
6. superior medial genicular artery (popliteal).
7. inferior medial genicular artery (popliteal).
8. anterior tibial recurrent artery (anterior tibial).

* Note that the middle genicular artery and the posterior tibial recurrent artery are not shown in the figure.

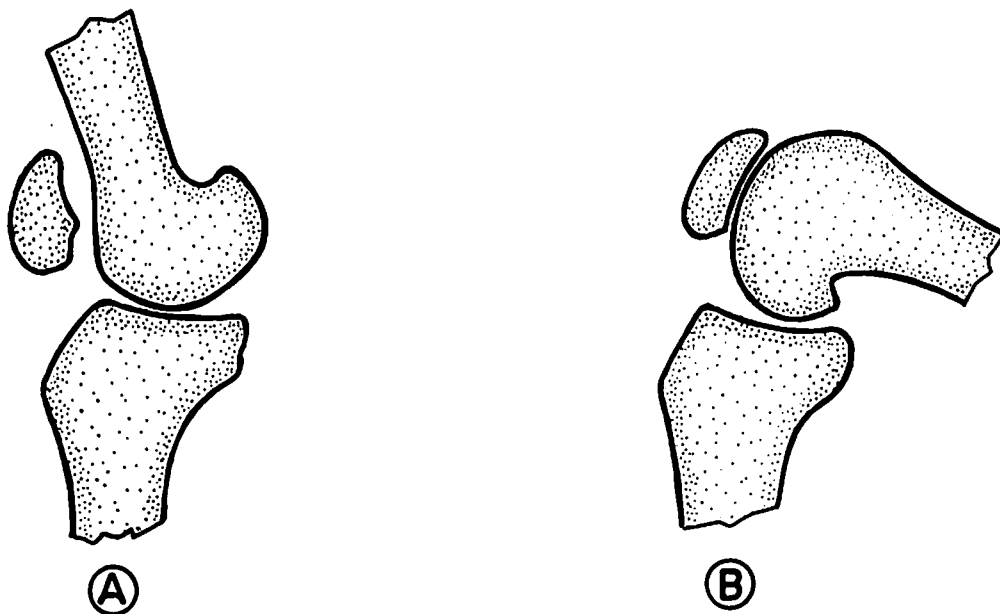


Fig.(328): EXTENSION AND FLEXION OF THE KNEE JOINT

(A) Full extension of knee joint.

(B) Full flexion of knee joint.

- * In full extension of the knee joint the patella is pulled upwards to come in contact with the patellar surface on the front of the femoral condyles (especially on the lateral condyle). Extension is associated with lateral rotation of tibia (or medial rotation of femur); this is called locking of the knee joint.
- * In flexion of the knee joint the patella comes more in contact with the lower surface of the medial femoral condyle, and the tibial condyles come in contact with the posterior surfaces of the femoral condyles. Flexion is associated with medial rotation of tibia by the action of popliteus (or lateral rotation of femur); This is called unlocking of the knee joint.
- * In full extension the patella is prevented from being laterally displaced by the attachment of the lowermost horizontal fibres of the vastus medialis to its medial border.

TIBIO-FIBULAR JOINTS

Fig.(329): TIBIO-FIBULAR JOINTS (posterior aspect)

The tibia and fibula articulate together at the superior and inferior tibio-fibular joints. The superior joint is a synovial joint, while the inferior joint is a fibrous joint (syndesmosis). In addition to these joints, the tibia and fibula are connected together by the interosseous membrane.

1. popliteal artery.
2. perforating branch of peroneal artery.
3. anterior tibial artery.
4. common peroneal nerve (passes behind the head of the fibula and curves forwards lateral to the neck of fibula).
5. interosseous membrane.
6. peroneal artery (on the back of fibula).
7. interosseous tibio-fibular ligament (the chief ligament of the inferior tibio-fibular joint).
8. inferior transverse ligament (extends from the malleolar fossa of the fibula to the back of the medial malleolus of the tibia close to the articular surface).

* The interosseous membrane stretches between the interosseous borders of the tibia and fibula, and its fibres run obliquely downwards and laterally from the tibia to the fibula. It is perforated above by the anterior tibial vessels and below by the perforating branch of peroneal artery.

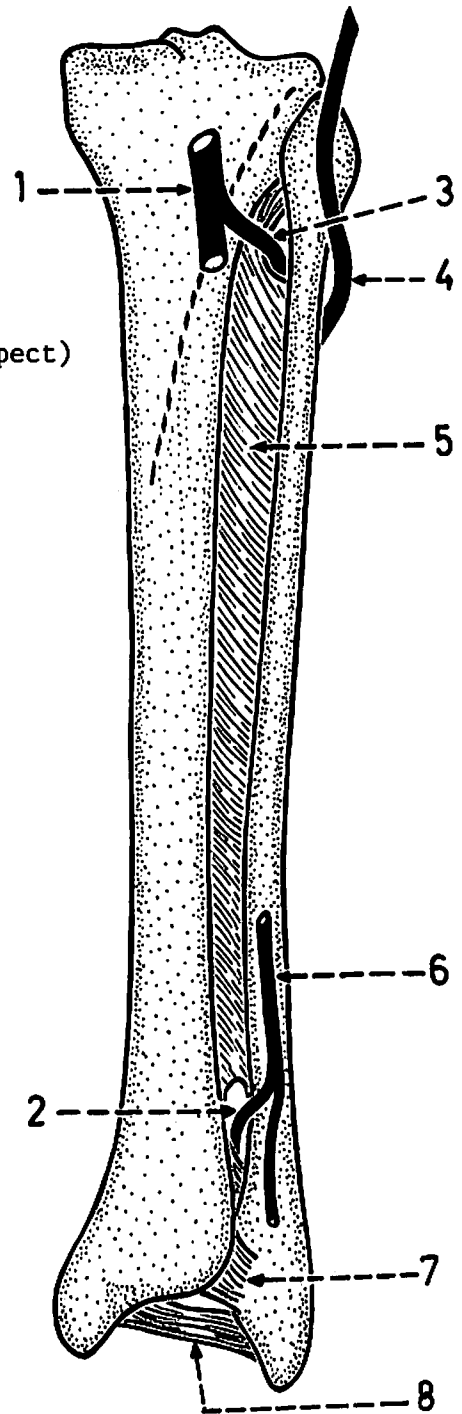


Fig.(330): ANTERIOR TIBIO-FIBULAR LIGAMENT

It extends between the lower ends of tibia and fibula in front of the interosseous ligament of the inferior tibio-fibular joint.

- * Note that the inferior tibio-fibular joint is a fibrous joint (syndesmosis) that consists of 3 ligaments: anterior tibio-fibular ligament (anteriorly), posterior tibio-fibular ligament (posteriorly) and a strong interosseous ligament (in between).

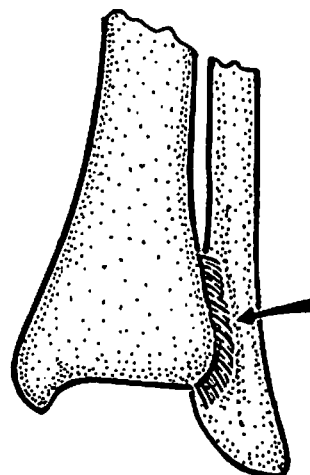
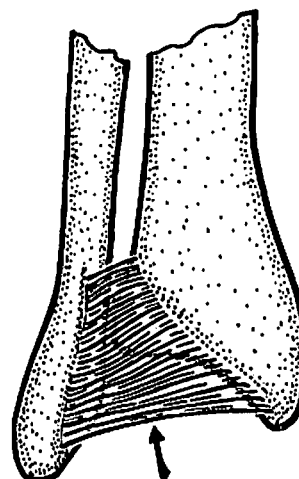


Fig.(331): POSTERIOR TIBIO-FIBULAR LIGAMENT

It extends between the lower ends of tibia and fibula behind the interosseous ligament of the inferior tibio-fibular joint. The lower border of this ligament forms a strong thick band called inferior transverse ligament which extends transversely from the malleolar fossa of the lower end of the fibula to the back of the medial malleolus close to the articular surface of tibia.



ANKLE JOINT

Fig.(332): ARTICULATING BONES OF ANKLE JOINT

The ankle joint is a typical hinge joint which is formed proximally by the lower ends of tibia and fibula as well as by the inferior transverse tibio-fibular ligament, and distally by the trochlea of the talus.

1. lateral malleolus (it extends downwards lower than the medial malleolus).
2. talus.
3. medial malleolus.

* The inferior transverse tibio-fibular ligament completes the socket of the joint from behind.

* The medial and lateral malleoli embrace the trochlea of the talus from the sides, thus preventing side-to-side movements.

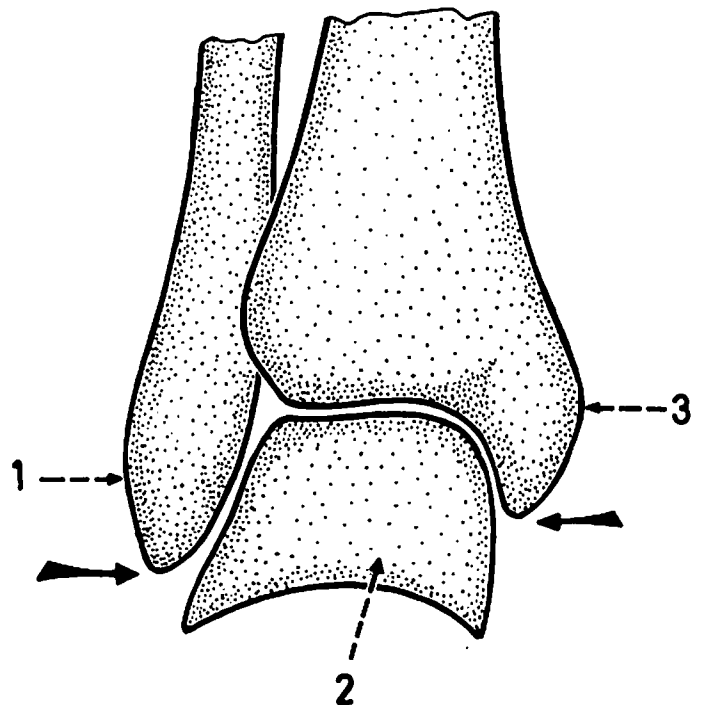
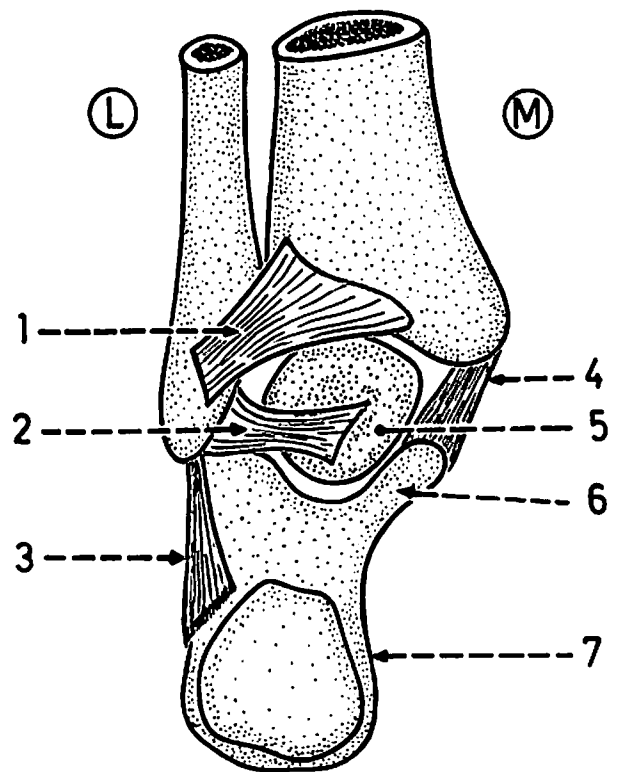


Fig.(333): LIGAMENTS SUPPORTING THE ANKLE JOINT (posterior view)

1. posterior tibio-fibular ligament (its lower part is called inferior transverse tibio-fibular ligament and supports the ankle joint from behind).
2. posterior talofibular ligament (passes transversely from the lateral malleolus to the talus).
3. calcaneo-fibular ligament.
4. deltoid ligament.
5. talus.
6. sustentaculum tali.
7. calcaneus.



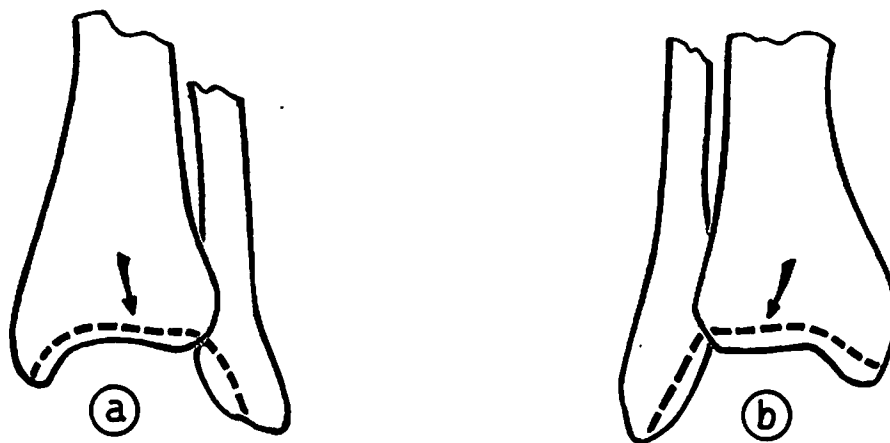


Fig.(334): PROXIMAL ATTACHMENT OF THE CAPSULE OF ANKLE JOINT

The capsule is attached to the lower end of the tibia and the 2 malleoli close to the articular surfaces. Posteriorly, it blends with the inferior transverse tibio-fibular ligament.

(a) anterior aspect.

(b) posterior aspect.

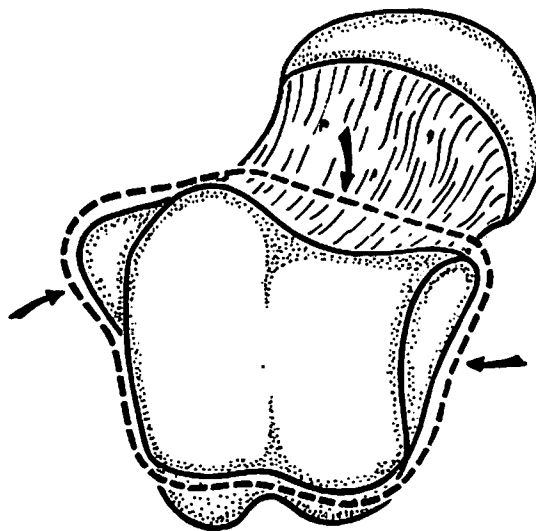


Fig.(335): DISTAL ATTACHMENT OF THE CAPSULE OF ANKLE JOINT

The capsule is attached to the talus close to its articular surface, on all sides. A small area of the superior surface of the neck of talus, close to the trochlea, is intracapsular.

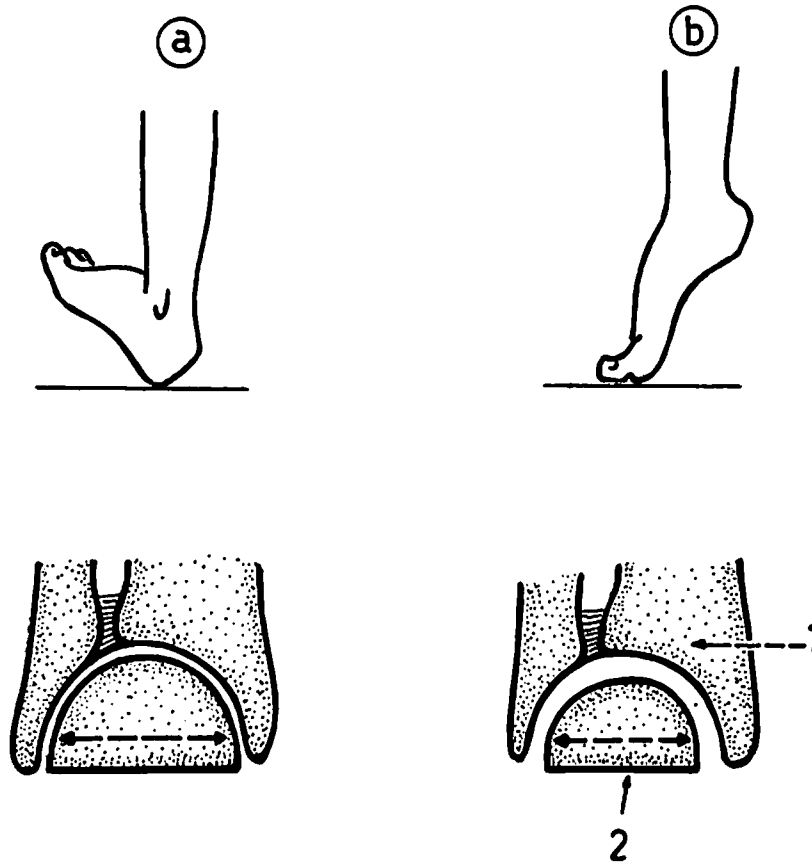


Fig.(336): STABILITY OF ANKLE JOINT

The ankle joint is more stable when the foot is slightly dorsiflexed because the broad part of the talus fits exactly into the broad part of the socket. However, when the foot is plantar flexed the wider part of the socket comes opposite the narrow posterior part of the trochlea of the talus thus allowing for some lateral movement of the talus, a position which predisposes to dislocation.

- (a) the ankle joint in dorsiflexion (the talus fits exactly in its socket).
 - (b) the ankle joint in plantar flexion (the talus does not fit exactly in its socket and some side-to-side movement is allowed).
1. socket (mortise) of ankle joint.
 2. trochlea of talus.

Fig.(337): MEDIAL (DELTOID) LIGAMENT OF THE ANKLE

It is a triangular ligament which is attached proximally by its apex to the tip of medial malleolus, and distally by its base to 5 structures: neck of talus, navicular bone, spring ligament, sustentaculum tali and posterior part of the body of talus (from before backwards).

1. deltoid ligament.
2. neck of talus.
3. navicular bone.
4. spring (plantar calcaneo-navicular) ligament.
5. sustentaculum tali.
6. posterior part of the body of talus.

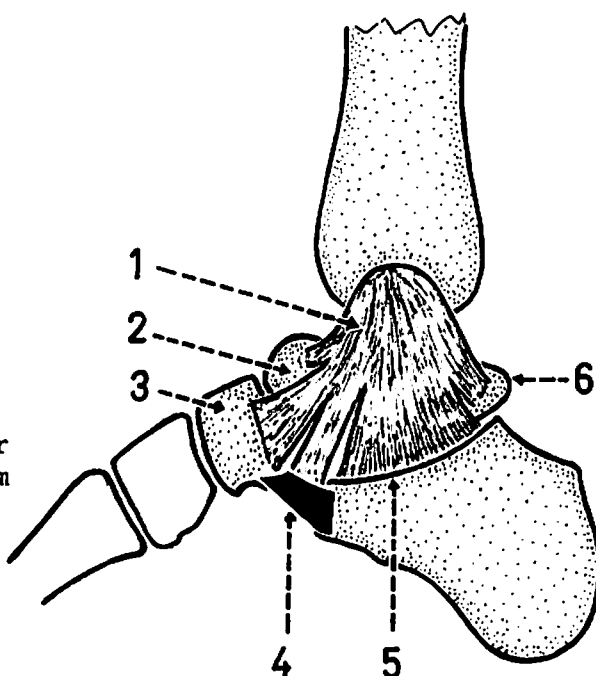


Fig.(338): TENDONS CROSSING THE DELTOID LIGAMENT

It is crossed by 2 tendons (one above the other): tendon of tibialis posterior above and tendon of flexor digitorum longus at the attachment of the ligament to the sustentaculum tali.

1. deltoid ligament.
2. sustentaculum tali.
3. tendon of tibialis posterior.
4. tendon of flexor digitorum longus.
5. tendon of flexor hallucis longus (on the under surface of the sustentaculum tali).

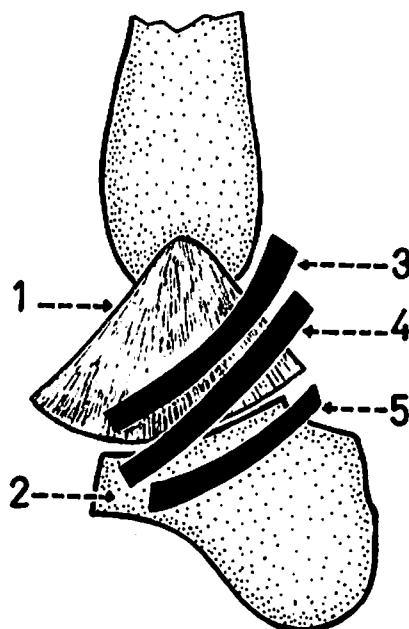


Fig.(339): LATERAL LIGAMENT OF THE ANKLE

It is formed of 3 bands: anterior talofibular (anteriorly), posterior talofibular (posteriorly) and calcaneofibular (in the middle).

1. posterior talofibular ligament (extends horizontally from the malleolar fossa of the lateral malleolus to the posterior process of the talus).
2. calcaneofibular ligament (cord-like band which extends downwards and backwards from the tip of lateral malleolus to the lateral surface of calcaneus).
3. anterior talofibular ligament (extends forwards and medially from the lateral malleolus to the neck of talus).
4. talus.

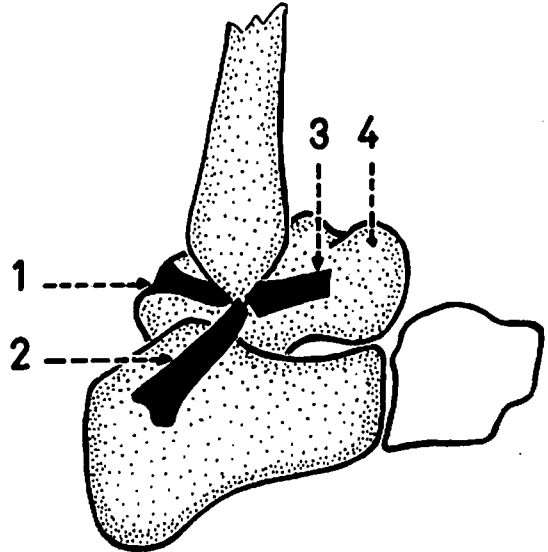
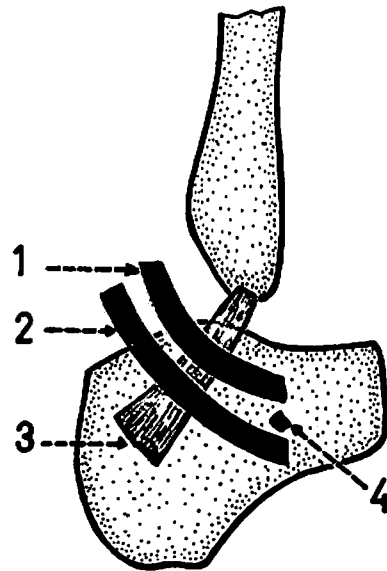


Fig.(340): TENDONS CROSSING THE CALCANEOFIBULAR LIGAMENT

It is crossed by 2 tendons (one above the other): tendon of peroneus brevis above and tendon of peroneus longus below.

1. tendon of peroneus brevis.
2. tendon of peroneus longus.
3. calcaneofibular ligament (middle part of the lateral ligament of the ankle).
4. peroneal trochlea between the 2 peroneal tendons.



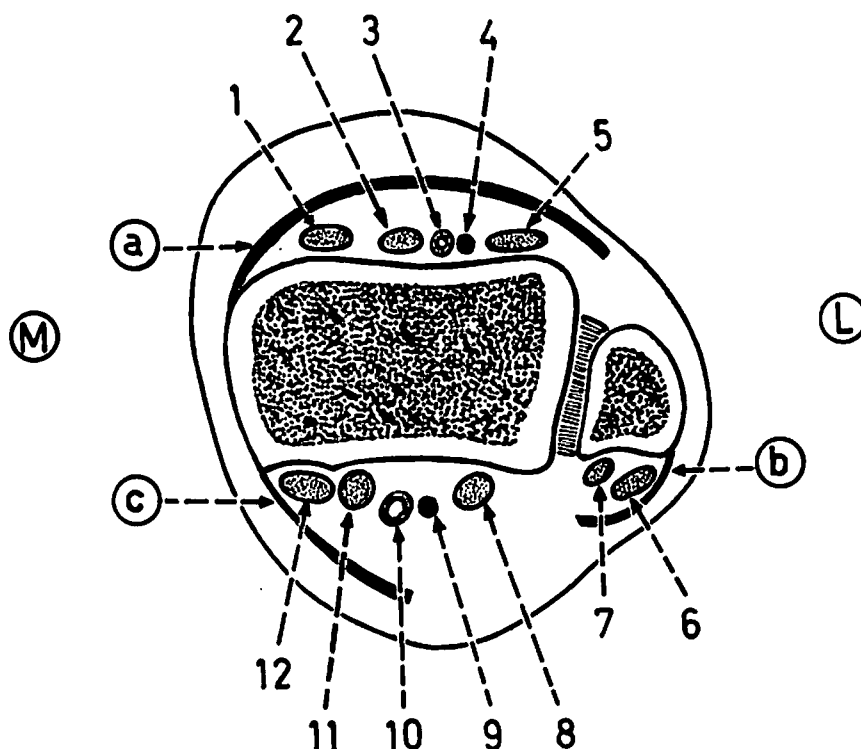


Fig.(341): STRUCTURES RELATED TO ANKLE JOINT (T.S.)

These are the structures which pass under cover of the retinacula of the ankle.

- (a) Structures under cover of extensor retinacula (from medial to lateral):
 - 1. tendon of tibialis anterior.
 - 2. tendon of extensor hallucis longus.
 - 3. anterior tibial vessels.
 - 4. deep peroneal nerve.
 - 5. tendon of extensor digitorum longus.
- (b) Structures under cover of peroneal retinacula:
 - 6. tendon of peroneus longus.
 - 7. tendon of peroneus brevis (deep to the longus).
- (c) Structures under cover of flexor retinaculum (from lateral to medial):
 - 8. tendon of flexor hallucis longus.
 - 9. tibial nerve.
 - 10. posterior tibial vessels.
 - 11. tendon of flexor digitorum longus.
 - 12. tendon of tibialis posterior.

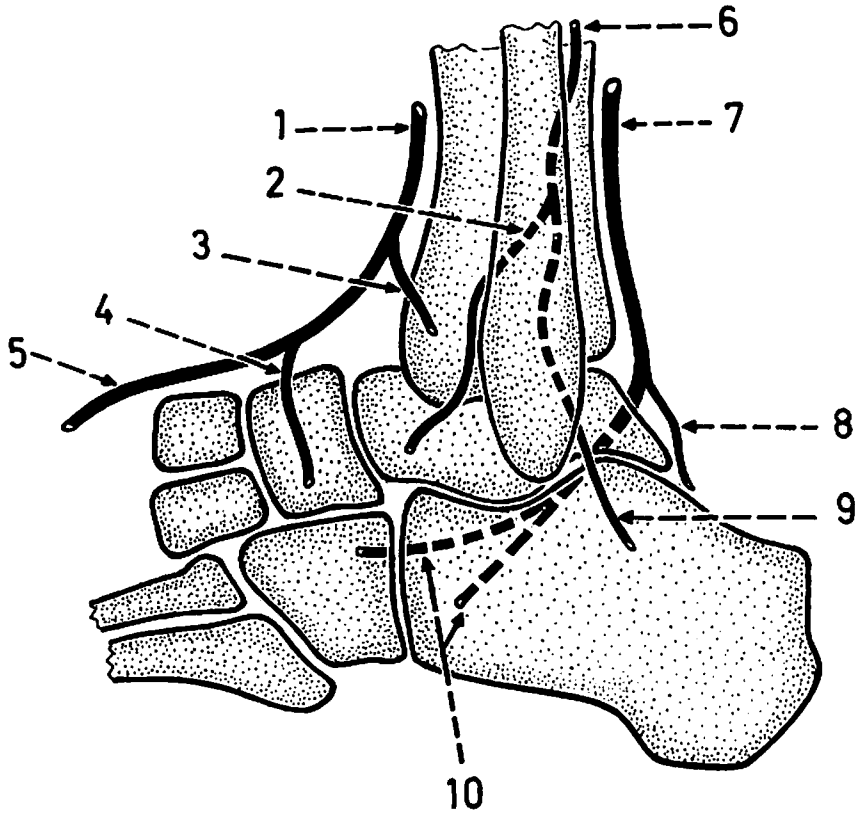


Fig.(342): ANASTOMOSIS AROUND THE ANKLE
(lateral view)

10 arteries share in the anastomosis around the ankle joint: lateral and medial malleolar branches of anterior tibial artery, medial malleolar and medial calcaneal branches of posterior tibial artery, lateral malleolar, lateral calcaneal and perforating branches of peroneal artery, lateral tarsal and medial tarsal branches of dorsalis pedis artery and a branch (or branches) from the plantar arteries (mainly lateral plantar).

1. anterior tibial artery.
2. perforating branch of peroneal artery.
3. lateral malleolar branch of anterior tibial artery.
4. lateral tarsal branch of dorsalis pedis artery.
5. dorsalis pedis artery.
6. peroneal artery.
7. posterior tibial artery.
8. medial calcaneal branch of posterior tibial artery.
9. lateral calcaneal branch of peroneal artery.
10. medial and lateral plantar arteries.

JOINTS OF FOOT

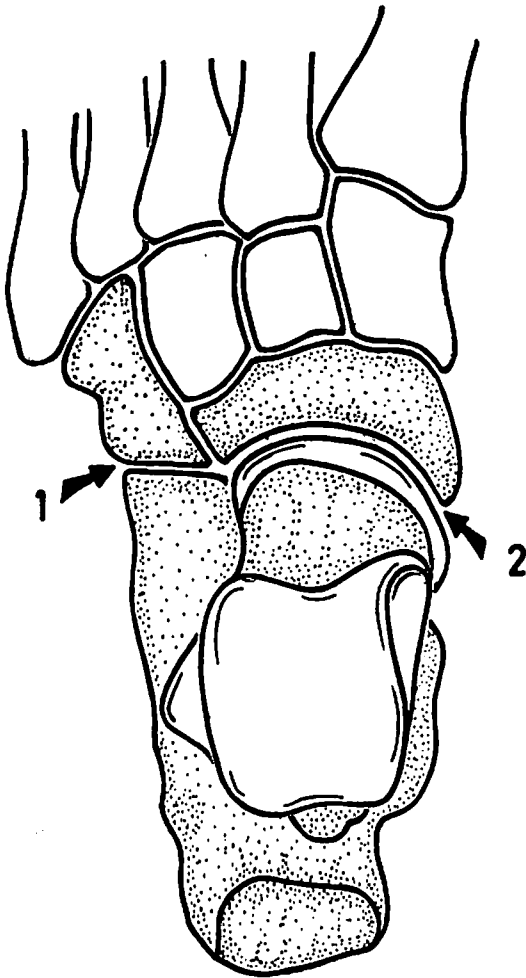


Fig.(343): TRANSVERSE TARSAL JOINT

This joint consists of both the talo-navicular and the calcaneo-cuboid joints which lie transversely side-by-side. The talo-navicular joint is formed between the head of talus and the navicular bone, while the calcaneo-cuboid joint is formed between the calcaneus and cuboid bone.

1. calcaneo-cuboid joint (laterally).
2. talo-navicular joint (medially).

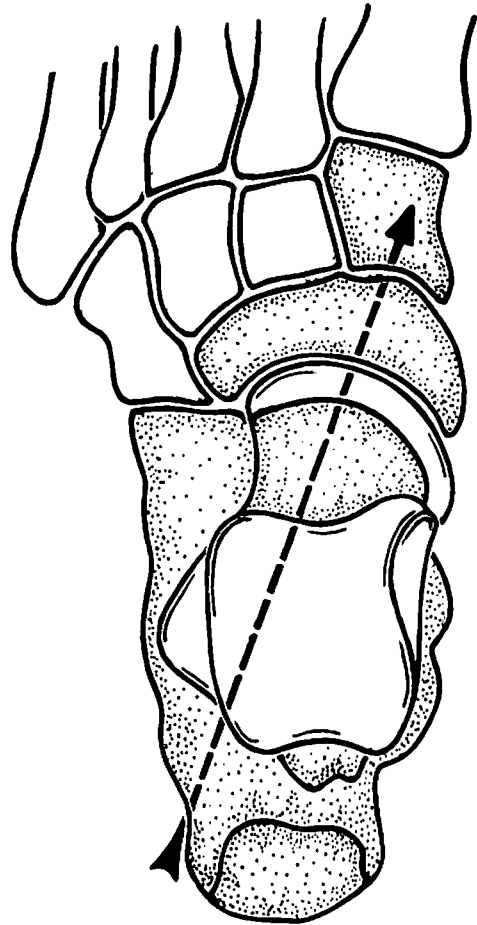


Fig.(344): AXIS OF EVERSION AND INVERSION

This axis passes upwards, forwards and medially through the head and neck of the talus. During eversion and inversion which take place around this axis the talus is always kept stationary but the rest of the foot underneath moves at the talo-calcanean (subtalar) and the talo-calcaneo-navicular joints.

Fig.(345): POSITION OF THE TALUS
BETWEEN THE ANKLE AND
SUBTALAR JOINTS
(coronal section)

The talus articulates above with the tibia and fibula to form the ankle joint (for dorsiflexion and plantar flexion), and articulates below with the calcaneus to form the subtalar joint (for eversion and inversion).

1. lateral ligament of the ankle.
2. talo-calcaneal (subtalar) joint.
3. calcaneus.
4. talus.
5. deltoid ligament (medial ligament of the ankle).
6. ankle joint.

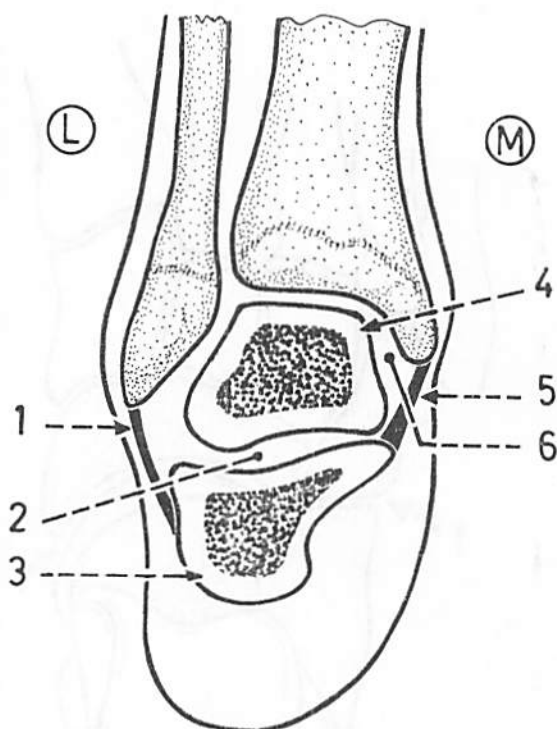


Fig.(346): SUBTALAR JOINT

The subtalar (talo-calcaneal) joint lies between the posterior facet on the inferior surface of the talus and the posterior facet on the upper surface of the calcaneus. It allows for eversion and inversion of the foot.

1. talus.
2. lateral ligament of the ankle.
3. calcaneus.
4. medial ligament of the ankle.
5. interosseous talo-calcaneal ligament (lies in the sinus tarsi, extending from the sulcus tali on the lower surface of talus to the sulcus calcanei on the upper surface of calcaneus).
6. subtalar joint.

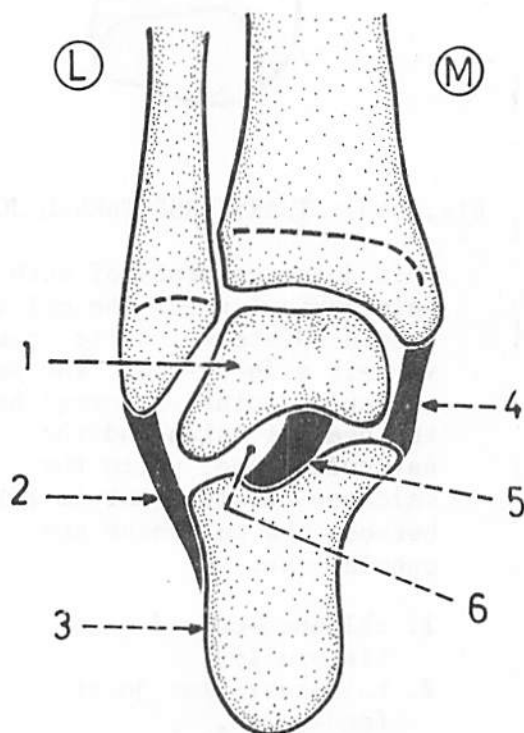


Fig.(347): TALO-CALCANEO-NAVICULAR JOINT

This joint is a ball-and-socket joint where the ball is formed by the head of talus while the socket is formed by the navicular bone, spring ligament and the anterior and middle facets (not the posterior facet) on the upper surface of the calcaneus. The tendon of tibialis posterior supports the spring ligament from below thus supporting the head of talus indirectly.

1. head of talus.
2. navicular bone.
3. spring (plantar calcaneo-navicular) ligament.
4. tendon of tibialis posterior (T.S.).
5. calcaneus.

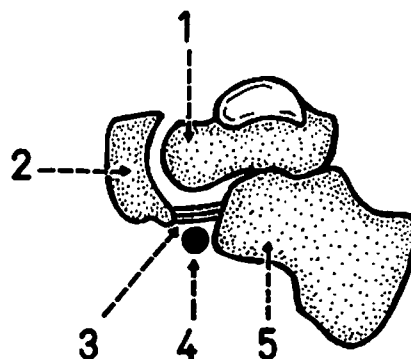
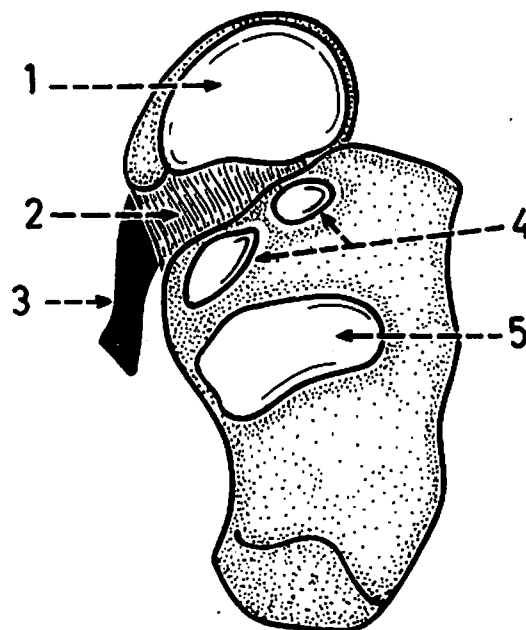


Fig.(348): SOCKET OF THE
TALO-CALCANEO-NAVICULAR JOINT
(seen from above)

It is formed by the posterior facet of navicular bone, spring ligament and the anterior and middle facets on the upper surface of calcaneus. It is a concave surface which receives the head of the talus.

1. posterior facet of navicular bone.
2. spring (plantar calcaneo-navicular) ligament.
3. tendon of tibialis posterior passing below the spring ligament.
4. anterior and middle calcaneal facets.
5. posterior calcaneal facet (does not enter in the formation of the talo-calcaneo-navicular joint, but it forms a part of the subtalar joint).



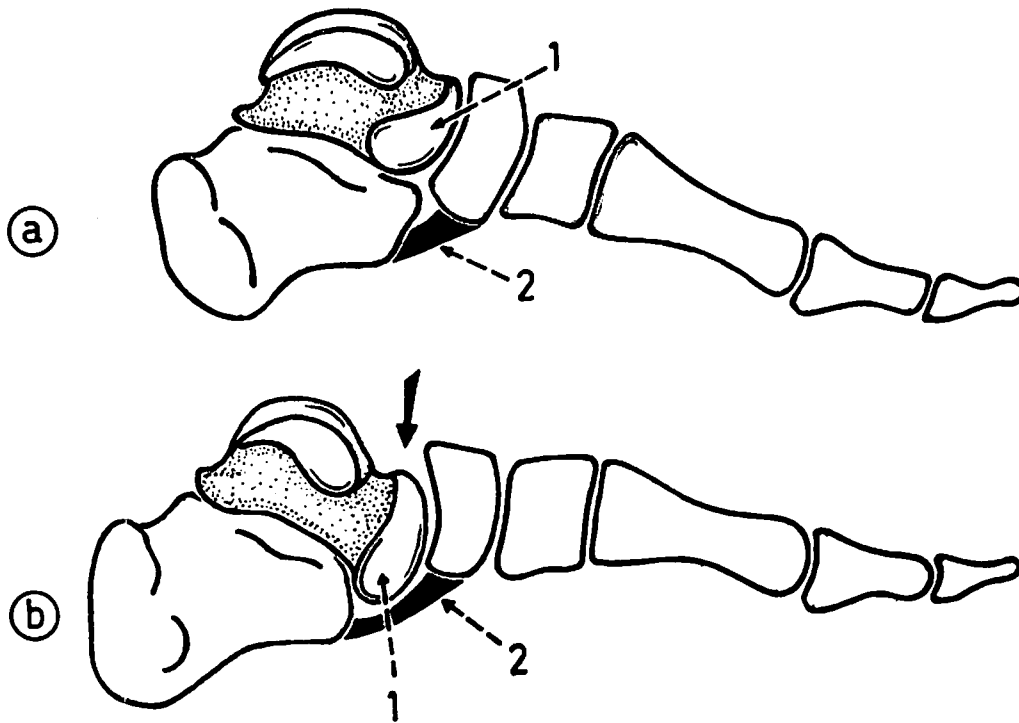


Fig.(349): SUPPORT OF THE HEAD OF TALUS BY THE SPRING LIGAMENT

- (a) Normal foot: the navicular and calcaneus are not widely separated.
 (b) Flat foot : the head of talus is thrust downwards between the navicular and calcaneus thus flattening the medial longitudinal arch.

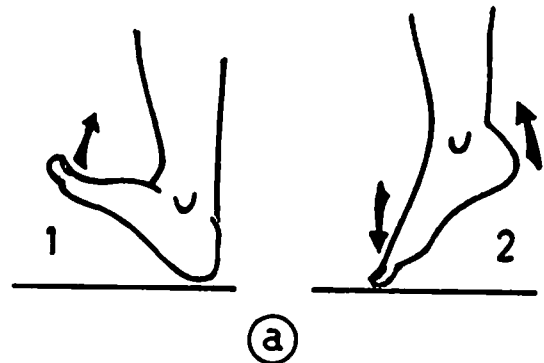
1. head of talus.

2. spring ligament.

Fig.(350): MOVEMENTS OF THE FOOT

(a) Movements at the ankle joint:

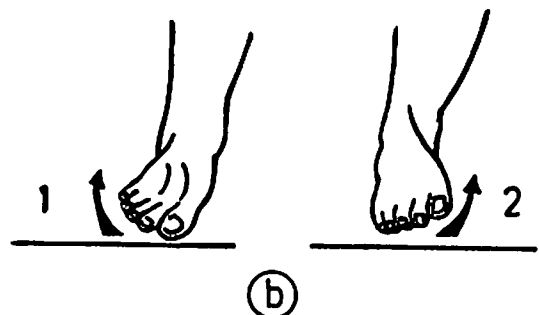
1. dorsiflexion.
2. plantar flexion.



(b) Movements at the subtalar and talo-calcaneo-navicular joints:

1. eversion.
2. inversion.

* In eversion the sole of the foot faces outwards, while in inversion it faces inwards.



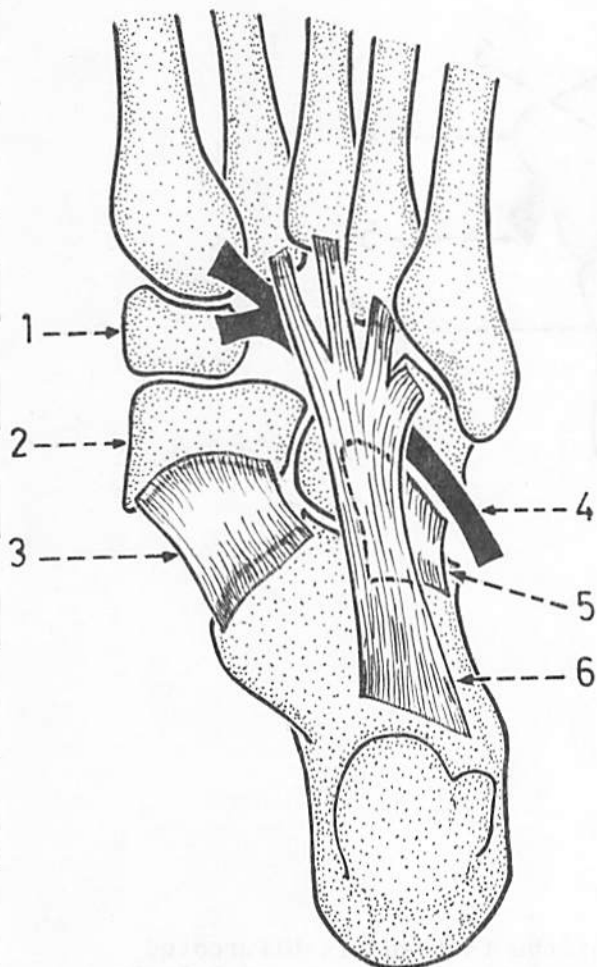


Fig.(351): LONG AND SHORT PLANTAR LIGAMENTS

These 2 ligaments lie on the lateral side of the sole of foot. The short plantar ligament extends from the calcaneus to cuboid bone, while the long plantar ligament is superficial and longer than the short plantar ligament and extends from the calcaneus to the bases of 2nd, 3rd and 4th metatarsal bones.

1. medial cuneiform bone.
2. navicular bone.
3. spring ligament.
4. tendon of peroneus longus (deep to long plantar ligament).
5. short plantar ligament.
6. long plantar ligament.

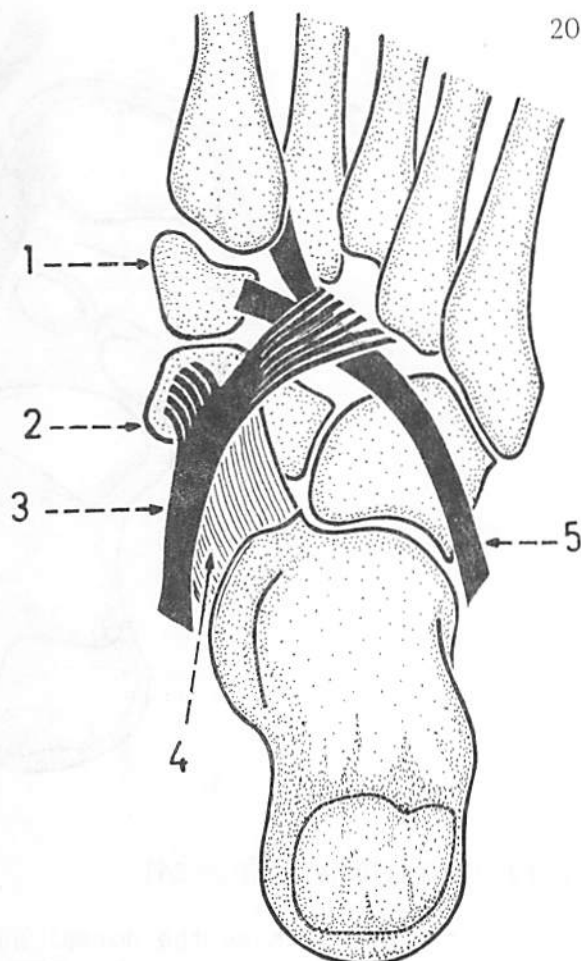


Fig.(352): SPRING (PLANTAR CALCaneo-NAVICULAR) LIGAMENT

This ligament lies on the medial side of the sole of foot, extending from the sustentaculum tali to the plantar surface of the navicular bone. Its lower surface is crossed by the tendon of tibialis posterior, while its upper surface supports the head of talus.

1. medial cuneiform bone.
2. tuberosity of navicular bone.
3. tendon of tibialis posterior.
4. spring ligament.
5. tendon of peroneus longus (lies in a groove on the cuboid bone).

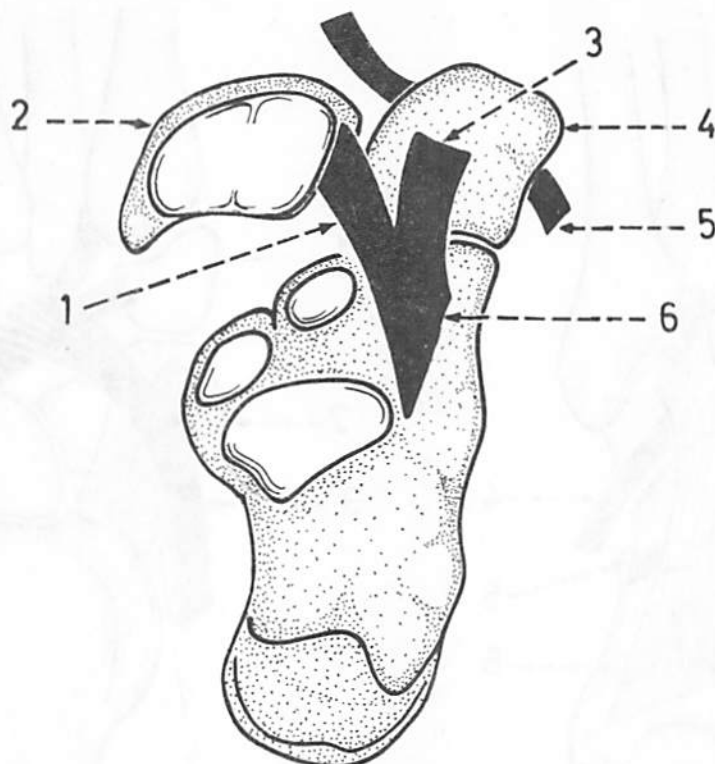


Fig.(353): BIFURCATE LIGAMENT

This ligament lies on the dorsal surface of the foot and is bifurcated having a stem attached to the upper surface of the calcaneus and 2 limbs (medial and lateral) attached to the navicular and cuboid bones.

1. medial limb of bifurcate ligament (attached to the navicular bone).
2. navicular bone.
3. lateral limb of bifurcate ligament (attached to cuboid bone).
4. cuboid bone.
5. tendon of peroneus longus.
6. stem of bifurcate ligament (attached to calcaneus).

Fig.(354): METATARSO-PHALANGEAL JOINTS (M/P)

The M/P joint is supported by the plantar ligament (on the plantar surface) and 2 collateral ligaments (on the sides).

1. base of proximal phalanx.
2. plantar ligament.
3. head of metatarsal bone.
4. deep transverse metatarsal ligament (connects the plantar ligaments of adjoining M/P joints).
5. collateral ligament.

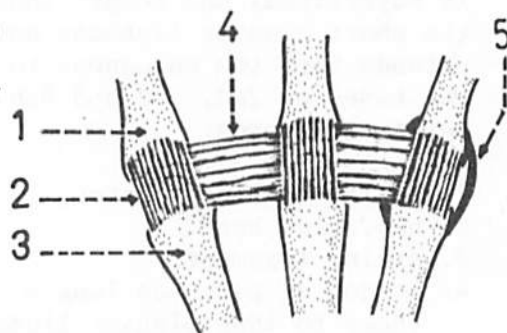
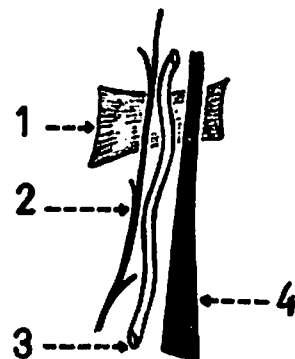


Fig.(355): DEEP TRANSVERSE METATARSAL LIGAMENT

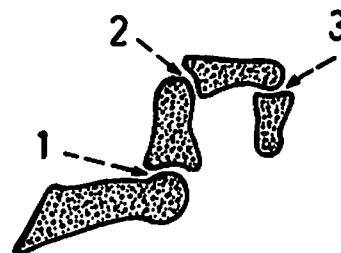
This ligament extends between the plantar ligaments of adjoining M/P joints and prevents the separation of the heads of metatarsal bones from each other. It is related on its plantar surface to a lumbrical muscle, plantar digital nerve and plantar digital artery, and is related on its dorsal surface to tendons of interossei.



1. deep transverse metatarsal ligament showing structures crossing its plantar surface.
2. plantar digital nerve.
3. plantar digital artery.
4. lumbrical muscle.

Fig.(356): HAMMER-TOE

It is a deformity of the toe resulting from paralysis of the lumbricals and interossei. As a result, the M/P joint is extended and all the I/P joints are flexed giving the toe the shape of a hammer.



1. M/P joint (extended).
2. proximal I/P joint (flexed).
3. distal I/P joint (flexed).

Fig.(357): HALLUX-VALGUS

It is the permanent adduction of the big toe at the M/P joint resulting in lateral deviation of the big toe towards the 2nd toe.



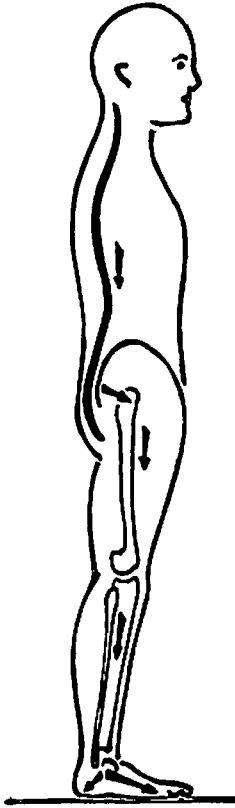


Fig.(358): TRANSMISSION OF BODY WEIGHT IN ERECT POSTURE

In the erect position, the body weight is transmitted from the vertebral column to the sacroiliac joints of both sides and then to the 2 hip joints. In the lower limb the body weight is transmitted from the head of femur to its 2 condyles especially the lateral condyle. It is then transmitted through the tibia (not the fibula) down to the talus where the weight is distributed forwards to the fore-part of the foot and backwards to the back-part of the foot (calcaneus).

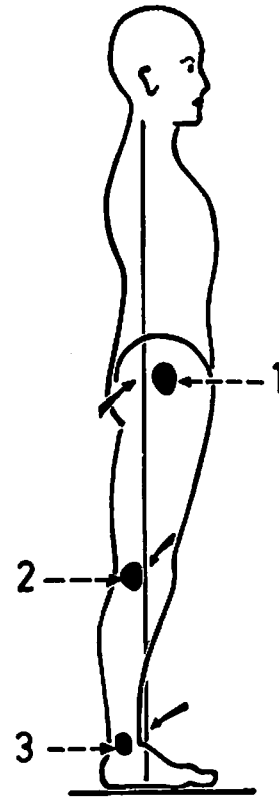


Fig.(359): CENTRE OF GRAVITY IN THE UPRIGHT POSITION

In the upright position, the centre of gravity passes slightly behind the 2 hip joints (1). This allows the trunk to be extended on the lower limbs, a position which is resisted by the iliofemoral ligaments. At the knee joint the centre of gravity passes slightly in front of the joint (2). This leads to hyperextension of the knee joint, a position which is resisted by the cruciate ligaments and the oblique popliteal ligament of the knee. Lower down, the centre of gravity falls slightly in front of the ankle joint (3). The body tends to fall forwards at the ankle joint, but this is resisted by contraction of the superficial muscles of the calf.

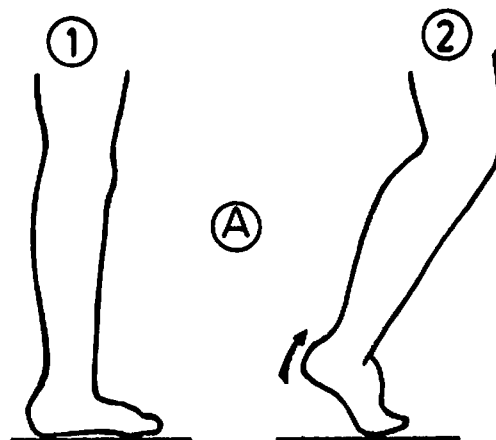
MECHANISM OF WALKING

Fig.(360): MECHANISM OF WALKING

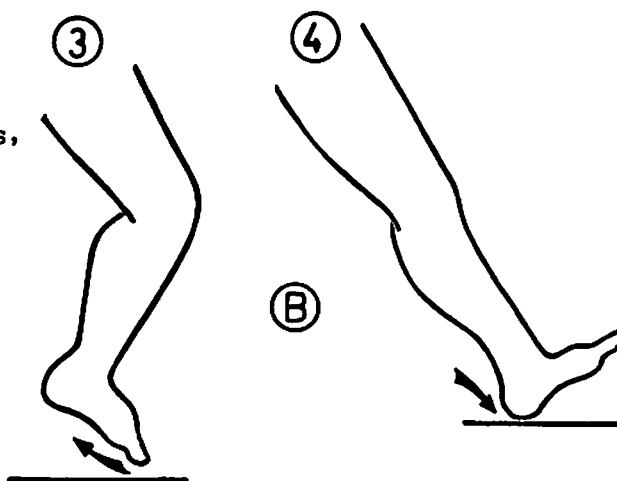
Walking movement consists of a series of steps which follow one another. A complete step consists of 2 phases which follow each other in succession: the 1st phase is called stance phase, i.e. the phase with the limb on the ground, and the 2nd phase is called swing phase, i.e. the limb is off the ground and is propelled forwards.

(A) Stance phase:

This phase starts by the foot resting on the ground and is weight bearing (1). The heel is then elevated (2) but the toes are still in contact with the ground.

(B) Swing phase:

This phase starts by elevation of the toes from the ground, i.e. toe-off (3). The leg is then propelled forwards, i.e. it swings, and the phase ends by bringing the heel in contact with the ground, i.e. heel-strike (4).



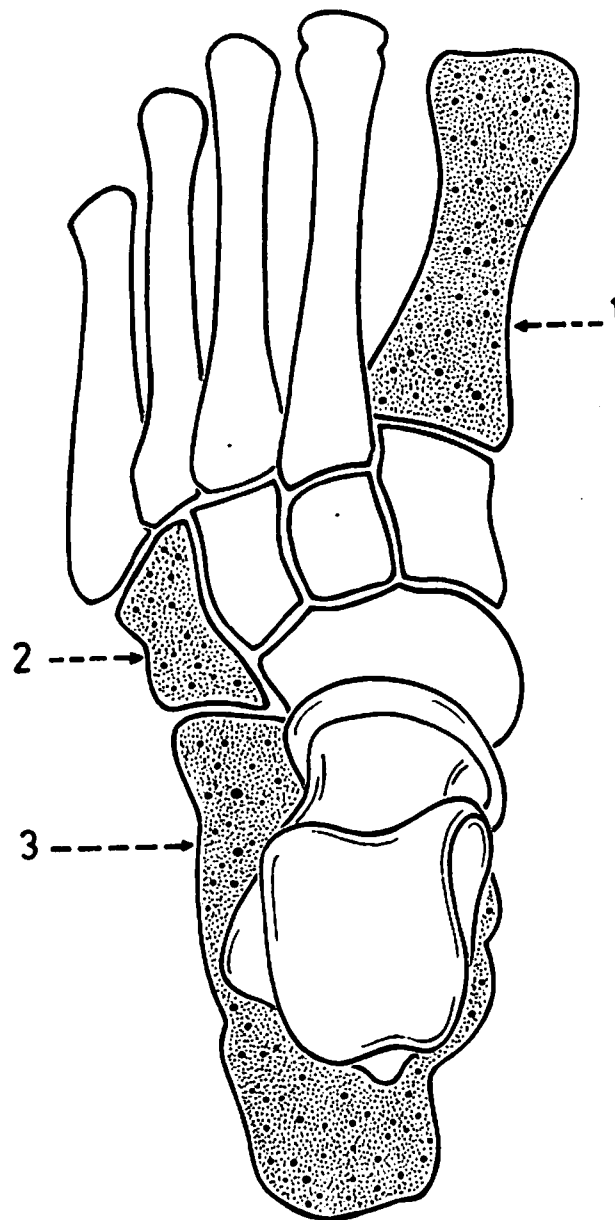


Fig.(361): ADAPTATION OF THE BONES OF THE FOOT TO WEIGHT BEARING

In the foot, the bony areas bearing the body weight are the calcaneus, the cuboid and the metatarsal bones especially the 1st. Accordingly, these bones undergo adaptation by which they enlarge in size and become thicker and stronger.

1. 1st metatarsal bone: is the thickest of all metatarsals.
2. cuboid bone: is thicker than any of the tarsal bones on the medial border of the foot.
3. calcaneus: is the largest bone of the tarsus.

